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October 19, 2001

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VIA HAND DELIVERY

Peter Karp
U.S. Forest Service
Forest Supervisor
Uintah National Forest
88 West 100 North
Provo, Utah 84601

Re: Uintah National Forest – Snowbird

Dear Peter:

In anticipation of your upcoming meeting with Messrs. Bonar and Baker of Snowbird, I provide you the enclosed memorandum addressing the Uinta National Forest's proposed CERCLA action.

Best regards,

Martin Banks/js

Martin K. Banks

MKB/js
Encl.

STOEL RIVES LLP

MEMORANDUM

October 19, 2001

TO: PETER W. KARP

CC: BOB BONAR
BOB BLACK
JAMES BAKER

FROM: MARTY BANKS

CLIENT: SNOWBIRD SKI AND SUMMER RESORT

MATTER: CERCLA -- The Uinta National Forest's CERCLA Investigation in the upper American Fork Canyon drainage

INTRODUCTION

The Uinta National Forest ("UNF") is investigating and is proposing to cleanup various abandoned mine sites in the upper American Fork drainage in Utah County, Utah. In particular, UNF's efforts appear to be focused on certain mining claims associated with the Pacific mine and the Dutchman mine sites. This memorandum outlines the conclusions drawn from our review of information relevant to UNF's investigation and the related proposed cleanup. We have reviewed the major reports and correspondence relevant to these issues (see attached bibliography), including UNF's website (www.fs.fed.us/r4/uinta/afc/afc.index.html).

This memorandum also addresses the appropriateness of going forward with the proposed cleanup from both an environmental technical perspective and from a Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA") legal perspective. Based on our review of the relevant information, the EPA has already determined that further remedial action was not warranted, UNF has not followed the CERCLA process, the Forest Service's "time-critical" removal is unwarranted, the scope and nature of the environmental impacts have been mischaracterized, and the relative risks simply do not warrant CERCLA action. If UNF is adamant about pursuing a CERCLA action, it should pursue the operators of the mining operations who are responsible for the historical contamination, not the innocent present owners who subsequently purchased some of the surface rights to the mine sites.

DISCUSSION

I. EPA Already Concluded that No Further Remedial Action is Warranted

From as early as 1985 through 1993, the EPA, UNF and the Utah Department of Natural Resources, Division of Oil, Gas and Mining ("DOGM") have conducted numerous environmental studies of the Pacific mine site. In 1994, after reviewing the extensive studies and investigations that had previously been conducted and after conducting yet additional studies, UNF prepared a comprehensive Preliminary Assessment ("PA") pursuant to the procedures set forth under CERCLA. Upon completion of its PA, UNF submitted the PA to the EPA to determine whether additional investigation was warranted. As set forth in the EPA's decisional document, "[t]he purpose of this sheet is to document the decision made at the conclusion of a CERCLA Preliminary Assessment with respect to future actions to be taken at the site. The Preliminary Assessment is designed to distinguish between sites that pose little or no threat to human health and the environment and sites that require further investigation." After an in-depth review of the PA, the EPA issued its PA Decision, which concluded "**NO FURTHER REMEDIAL ACTION PLANNED (NFRAP) - Site does not qualify for further assessment under CERCLA.**" *See* EPA Preliminary Assessment Decision, attached as Exhibit A. In lieu of a NFRAP conclusion, the stock EPA PA Decision form alternatively allows for a "DEFERRED" option. Significantly, the EPA unequivocally opted for the NFRAP rather than the DEFERRED option, confirming its considered, deliberate and unequivocal determination that the site did not warrant any further investigation or remedial action.

It is inappropriate for UNF to now ignore the substantive conclusions of the particular agency (EPA) that is charged with evaluating such environmental issues, or to waste federal resources re-assessing an issue that has already been thoroughly assessed.

Moreover, even if such cleanup activities were warranted, other governmental programs having primary jurisdiction over such abandoned mine reclamation have already addressed or can adequately address any needed reclamation efforts (*e.g.*, Office of Surface Mining/Division of Oil, Gas and Mining Abandoned Mines Program; Forest Service Abandoned Mines Program; and Corps of Engineers Reclamation of Abandoned Mine Lands Program, etc.).

II. The Proper CERCLA Process Has Not Been Followed

CERCLA was created in 1980 to provide broad federal authority, and industry generated funds, to respond to releases of hazardous substances that endanger public health or the environment. CERCLA imposes liability on persons responsible for such releases (potentially responsible parties, or "PRPs"). The U. S. Forest Service has delegated authority to implement certain response actions under CERCLA on National Forest System lands. (Executive Order 12580, 1/23/87, attached as Exhibit B)

The CERCLA process entails a specific, step-by-step approach starting with initial identification and characterization of potential sites, performing various screening tests or risk

assessments to ascertain the relative risks that may be present, and where necessary designing appropriate monitoring measures or remedial actions. This process must be completed before any remedial actions are actually undertaken. Briefly, a Preliminary Assessment ("PA") is completed which results in an initial risk score. If the score is over a certain threshold (28.5), the site is added to the CERCLIS list. A Site Inspection ("SI") and Hazard Ranking System ("HRS") are then employed to compile and document additional information, then the initial scoring of risk is revised to reflect the additional information. As for those sites that warrant additional investigation, they are put on the National Priorities List ("NPL"). A Remedial Investigation ("RI") is then conducted, followed by a Feasibility Study ("FS"). At that point, the agency will generally undertake remedial action. As for those sites that do not warrant additional investigation, they are not put on the NPL, a RI is not warranted, an FS is unnecessary, and remedial action is not undertaken.

On the basis of the documentation provided by UNF in this matter, the CERCLA process has not been followed and completed to the point necessary to design, let alone implement, a cleanup action such as UNF is proposing. There are certainly no emergency conditions in this drainage that warrant such a deviation from standard CERCLA procedure.

III. The Forest Service's "Time-Critical" Removal is Unwarranted

As explained in more detail below, CERCLA contemplates two different types of environmental response actions: (1) removal actions, and (2) remedial actions. The contamination associated with the Pacific and Dutchman mine sites is not significant enough to warrant the cost of the extensive environmental review and public participation that would be required before undertaking a remedial action, let alone the significant cost of the actual remedial action itself. To avoid the costly and time-consuming NEPA review, the Forest Service has short-circuited the process by creatively casting its cleanup efforts as a "removal" action in an attempt to avoid the cost of conducting NEPA review and yet to preserve the ability to conduct some kind of response action. The Forest Service should not delve into a response action if it is not willing to incur the cost and spend the time to satisfy its NEPA review obligations (or functional equivalency). The Forest Service's tack of casting its efforts as a "removal" action is unwarranted in that the contamination does not present any emergency or immediacy that would

justify a removal action.[1] Even if the contamination did warrant some kind of removal action, it certainly would not warrant a "time-critical" removal.

The CERCLA statutory structure provides for two distinct types environmental response actions. A "removal" action is generally an emergency effort to address an immediate threat. A removal "means the cleanup or removal of released hazardous substances ..., such actions as may be necessary taken in the event of the threat of release of hazardous substances . . . , or the taking of other actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment . . . . The term includes . . . security fencing or other measures to limit access, provision of alternative water supplies, temporary evacuation and housing of threatened individuals . . . ." 42 U.S.C. § 9601(23). In contrast, a "remedial" action is generally a longer-term measure that is the result of considerable deliberation, and that will constitute a final and permanent response to a non-emergency environmental situation.[2]

Removal actions under CERCLA are classified by EPA into three categories: emergency removals, time-critical removals and non-time-critical removals. *(CERCLA Enforcement Project Management Handbook* at 2.1.D (EPA 1999) attached as Exhibit B1) The Forest Service has caste its action as a time-critical removal, as a short-cut to avoid having to comply with NEPA, even though the contamination at the Pacific and Dutchman mine sites is not time-critical.

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[1]Prior to determining whether a removal action is time-critical or non-time-critical, the lead agency must first conclude that a removal action is appropriate. *See generally* CERCLA § 104(a) (42 U.S.C.A. § 9604(a)); CERCLA § 101(23) (42 U.S.C.A. § 9601(23)). Whether or not a removal action is appropriate is determined by weighing a number of factors set forth in 40 C.F.R. § 300.415(b)(2). Those factors are: (i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants; (ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems; (iii) Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers, that may pose a threat of release; (iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate; (v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released; (vi) Threat of fire or explosion; (vii) The availability of other appropriate federal or state response mechanisms to respond to the release; and (viii) Other situations or factors that may pose threats to public health or welfare of the United States or the environment.

[2]A "remedial action" means "those actions consistent with [a] permanent remedy taken instead of or in addition to removal actions . . . , to prevent or minimize the release of hazardous substances so that they do not migrate or cause substantial danger to present or future public health or welfare or the environment. The term includes . . . such actions at the location of the release as storage, confinement, perimeter protection using dikes, trenches, or ditches, clay cover, neutralization, cleanup . . . recycling or reuse, diversion, destruction, segregation of reactive waste, dredging or excavations, ..." 42 U.S.C. § 9601(24).

The terms "time-critical removal" and "non-time-critical removal" are not used in the EPA regulations. EPA introduced the terms in an effort to distinguish those types of removal actions that warrant extensive environmental review and public participation under NEPA. (*See Policy on Environmental Review Requirements for Removal Actions*, OSWER Directive 9318.0-05 (EPA April 13, 1987) attached as Exhibit B2) EPA defines the categories of removal actions based upon site evaluations which identify the type of situation, the urgency and threat of the release or potential release, and the time frame in which the action must be initiated. *See id.* at 2-3. In guidance, EPA has explained time-critical removal actions as follows:

> Time-Critical Removal Actions are actions initiated in response to a release or threat of release that **poses a risk to public health or welfare or the environment, such that cleanup or stabilization actions must be initiated within six months** following approval of the action memo. The time-criticality of the response is unrelated to the cost or duration of the response. Classic Emergencies are not included in this category. **This six-month time frame within which response must be initiated is based upon the determination that a threat exists that must be addressed within six months**. This determination is independent of the question of resource or contractor availability to actually commence the action within that time frame, or delays due to unexpected weather conditions, etc. Thus, if initiation of a time-critical action is delayed past six months for these reasons, it is still considered time-critical for purposes of NEPA compliance. Examples include response to an industrial site in a residential area containing open tanks of hazardous substances and spilled materials, response to a facility containing eroding unlined waste lagoons, or response to an unregulated waste dump containing scattered piles of deteriorating drums.

Id. at 2 (emphasis added). On the other hand, non-time-critical removal actions are defined as:

> actions initiated in response to a release or threat of release that poses a **risk** to public health or welfare or the environment, **such that initiation of removal cleanup or stabilization actions may be delayed for 6 months or more after completion of the preliminary assessment**, regardless of cost or duration of the response. An example of such an action might be response to an abandoned industrial dump, isolated from public access, which poses a potential threat to groundwater if not cleaned up. Cleanup may also be delayed in situations where hazardous substances have been abandoned on a site, but the substances are in stable containers and secured from public access. A final example might be an asbestos deposit that is currently stabilized. The two primary considerations in determining whether site response can be delayed are the stability of the wastes and the potential for public contact.

Id. Thus, the distinction between time-critical removal actions and non-time-critical removal actions is the urgency of the situation. (*See also Enforcement Project Management Handbook* at

2.1.D. attached as Exhibit B1) The importance of this distinction is found when considering the requirements of NEPA. NEPA commands federal agencies, including the Forest Service and EPA, to access and weigh the potential environmental impacts through an Environmental Impact Statement ("EIS") and to provide for public input where an action may have a significant affect on the quality of the human environment. NEPA § 102(C) (42 U.S.C.A. § 4332(C)).[3] In the *Policy on Environmental Review Requirements for Removal Actions*, EPA concluded that time-critical removal actions are exempt from NEPA environmental review and public participation requirements based upon a statutory conflict, and that non-time-critical removal actions are not exempt from NEPA. As EPA explained: "Classic Emergency and Time-Critical Removal Actions are exempt from compliance with EIS requirements based on statutory conflict (*i.e.*, the CERCLA directive for prompt action). Non-Time Critical Removal Actions require environmental review and public comment." *Id.* at 3.[4]

The Preliminary Assessment for the Pacific mine site was completed clear back in 1994, **seven years ago**. It is difficult to understand how the Forest Service can possibly now conclude that the Pacific mine site, which was NFRAPd and has sat idle since 1994, now warrants a time-critical removal action, which, as discussed above, is defined as an action "initiated in response to a release or threat of release that **poses a risk to public health or welfare or the environment, such that cleanup or stabilization actions must be initiated within six months**

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[3]NEPA further directs that the public laws (*e.g.*, CERCLA) be interpreted and administered in accordance with NEPA "to the fullest extent possible." NEPA § 102 (42 U.S.C.A. § 4332). Applying that provision, the federal courts have determined that particular federal actions may be exempt from NEPA where an agency demonstrates an irreconcilable conflict between the requirements of NEPA and the requirements of another statute. *Westlands Water District et al. v. U.S. Department of Interior et al.*, 43 F.3d 457, 460 (9th Cir. 1994). As the court stated in *Westlands Water District*, "[o]nly if there is an 'irreconcilable' conflict between the statute and NEPA will the requirements of NEPA not apply. An irreconcilable conflict is created if a statute mandates a fixed time period for implementation and this time period is too short to allow the agency to comply with NEPA." *Id.*, *citing Jones v. Gordon*, 792 F.2d 821, 826 (9th Cir.1986).

[4]Although non-time-critical removal actions are not exempt from NEPA's requirements, the federal courts have also created an exception to NEPA if an agency achieves "functional compliance" with the statute through an examination of environmental questions that ensures full and adequate consideration of the environmental issues. *Environmental Defense Fund, Inc. v. EPA*, 489 F.2d 1247, 1256-1257 (U.S. App. D.C. 1973); *Municipality of Anchorage v. U.S.*, 980 F.2d 1320, 1329 (9th Cir. 1992). Pursuant to that authority, EPA developed procedures for an Engineering Evaluation/Cost Analysis ("EE/CA") to be performed for non-time-critical removal actions—*i.e.*, the EE/CA analysis is the functional equivalent of NEPA procedures. *See generally Policy on Environmental Review Requirements for Removal Actions* at 3; 40 C.F.R. § 300.415(b)(4)(i). Thus CERCLA requires an EE/CA for non-time-critical removal actions; but it does not require an EE/CA for time-critical removal actions. 40 C.F.R. § 300.415(b)(4)(i).

following approval of the action memo... **This six-month time frame within which response must be initiated is based upon the determination that a threat exists that must be addressed within six months.**" (*See Policy on Environmental Review Requirements for Removal Actions*, OSWER Directive 9318.0-05, at 2, attached as Exhibit B2). The contamination in question does not warrant remedial action (as EPA and the Forest Service would readily concede); moreover, the contamination does not warrant removal action, certainly not time-critical removal action. If the contamination is not significant enough to warrant the Forest Service's proper compliance with NEPA, it is not significant enough to warrant any response action, neither remedial nor removal.

IV. The Environmental Impacts Have Been Mischaracterized

Much of the investigation work considered by UNF suffers from fatal defects in data collection, analysis and interpretation. The result is overstatement and mischaracterization of the environmental impacts.

A. Total v. Dissolved Concentrations: Several water quality studies considered by UNF inappropriately compared samples analyzed for total concentrations of metals with standards expressed in dissolved concentrations. Because dissolved concentrations are generally a small fraction of total concentrations, this apples-to-oranges comparison patently invalidates many of UNF's conclusions. As an example, the graphs at Exhibit C illustrate the difference between total and dissolved concentrations for aluminum and iron in the vicinity of the Pacific mine site. The other metals addressed in the cited studies were either below the limits of detection or, in a few cases, showed similar figures for total and dissolved concentrations. (Merrit 1988, attached as Exhibit D; Lidstone & Anderson 1993, attached as Exhibit E; UNF 1998, Website, Water Samples, attached as Exhibit F)

B. Chronic v. Acute Standard: The water quality studies cited by UNF involve grab samples (single, one-point-in-time samples) which were subsequently compared with a more stringent 4-day chronic standard rather than the applicable 1-hour acute standard. The 4-day standards are substantially more restrictive. The standard practice, and the Utah Division of Water Quality guidance, is to compare such grab samples with the 1-hour acute standard. Again, comparing grab samples with the more stringent 4-day chronic standard results in incorrect, overstated and invalid conclusions regarding the magnitude of any water quality impairment. Exhibit F illustrates the distorted impact of UNF's use of the wrong standard; using the 4-day standard resulted in 14 exceedences at the sampling sites near the Pacific and the Dutchman sites, while using the correct 1-hour standard reduced that number to 8. (UNF 1998, Website, Water Samples, attached as Exhibit F; Graphs Contrasting Total and Dissolved Concentrations, and also Chronic and Acute Standards, attached as Exhibit C) Of course, the number of exceedences would be reduced even further if UNF had used the dissolved concentrations as it should have rather than the total concentrations.

C. Macroinvertebrates: The text on the UNF webpage cites "severe" impacts to aquatic macroinvertebrates, but the supporting data reflects very minor, localized impacts. As

to the three primary parameters measured at the sampling sites at or near the Pacific and Dutchman sites (Stations 3A, 8 & 9), 7 (of 18) of the samples fall in the "excellent" range, 5 fall in the "good" range, 5 fall in the "fair" range, and **just 1 falls in the poor range**. (Merrit 1988, attached as Exhibit D; UNF 1998, Website, Macroinvertebrate Analysis, attached as Exhibit G)[5] In summary, 17 of the 18 reported indices fall within the excellent-good-fair range, and only one 1 falls within the poor range. Moreover, none of the sites sampled at or near the Pacific and Dutchman sites (Stations 3A, 8 & 9) detected zinc in excess of the 100 ppb threshold for sensitive invertebrates. (Merrit 1988, attached as Exhibit D; UNF 1998, Website, Macroinvertebrate Analysis, attached as Exhibit G)

D. Non-drinking Water: The initial Merrit water quality studies unjustifiedly compared its findings with the drinking water standards. (Merrit, 1988) These waters are not drinking water sources, and the State has never assigned drinking water standards to these waters. UNF also continues to inappropriately display domestic standards ("1C)" with water quality data on its website. (UNF, Website, Water Samples, attached as F) UNF's implication to the public that this is drinking water or that the water quality data should be compared with drinking water standards is misleading and unnecessarily alarming.

E. Background Levels: UNF relies upon "high" metal concentrations in the surface water as justification for its proposed cleanup, but fails to put those "high" concentrations into the context of the background concentration levels. For example, a tracer study conducted in Little Cottonwood Canyon showed that the nearby White Pine Canyon, where there was virtually no historic mining activity, is a primary source of metal contamination. Another water quality study showed very high, naturally occurring metals concentrations in Mary Ellen Creek above the point that mining had occurred. (KW Brown, 1999, Table re Mary Ellen Surface Water Laboratory Results, attached as Exhibit H) The KW Brown study shows the dissolved concentrations of metals in water samples from this naturally occurring bog compared with samples from the most contaminated mine adit in Mary Ellen Gulch. For some metals, the naturally occurring source produces higher concentrations than even the mine adit. Briant Kimball of the U.S. Geologic Survey has opined that the ore body within the ridge separating Little Cottonwood Canyon from American Fork Canyon outcrops or surfaces in various locations, probably accounting for the high background levels observed in the White Pine and Mary Ellen watersheds. Accordingly, because it is readily apparent that a significant portion of the

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[5]As to that 1 sample that fell within the poor range, it is noteworthy that the .4 ppb was close to the upper end of the 0 - .5 poor range, placing it very near the .6 - 1.5 fair range. Moreover, that Station was sampled twice that year and at the other event it measured at .7, within the fair range.

The UNF data miscolors two of the DAT sample results for Stations 3A and 9 (19.2 and 18.2 respectively); those sample results should be green (reflecting the 17 - 26 excellent range) rather than blue (reflecting the 10 - 17 good range).

concentrated metals in the area surface waters are attributable to mere background concentrations rather than past mining practices, UNF's proposed cleanup activities are unwarranted.

V. The Relative Risks Do Not Warrant CERCLA Action

As justification for its proposed remedial activities, UNF alleges that there are potential risks to (1) recreational users from airborne exposures, (2) consumers of fish that have absorbed the contaminants and (3) macroinvertebrate populations that are necessary to sustain trout species (Brown and Cutthroat). (UNF 2000, Community Relations Plan, p. 3, attached as Exhibit I)

A. The Alleged Airborne Exposure

1. The Airborne Exposure Justification is Unsupported: UNF attempts to justify the need for its proposed cleanup action in part by alleging potential risks to recreational users from airborne exposures. (UNF 2000, Community Relations Plan, p. 3, attached as Exhibit I) However, the data presented to justify the CERCLA action is water quality data, not relevant to the alleged potential airborne exposure. UNF does not present any survey data or any other data even attempting to quantify the exposure of the potential recreational users. Moreover, UNF does not present any toxicological studies or literature establishing acceptable risk levels.

2. Enforcement of Existing ORV Regs Would Cure Concerns: ORV use on the tailing piles is already prohibited under UNF's Travel Plan. (UNF 2000, Community Relations Plan, p. 9, attached as Exhibit I) Therefore, signage, fencing and appropriate enforcement of existing regulations would adequately mitigate any adverse effects.

3. Recreational Exposure is Isolated: Recreational use of these areas remains relatively low. The visitor counts cited on UNF website were at the canyon mouth, not in the much less accessible upper reaches where the subject mine sites are located. (UNF 2000, Community Relations Plan, p. 3, attached as Exhibit I)

4. Alternative Potential Airborne Pathway: UNF has used the mine tailings for road base in the American Fork canyon, creating a much more plausible potential pathway of exposure. UNF's resources would be better utilized cleaning up that road base (which receives daily automobile use) rather than the more isolated tailing piles (which now receive only very limited ORV use).

B. The Alleged Consumption of Fish Exposure

1. The Consumption of Fish Justification is Unsupported: UNF also attempts to justify the need for its proposed cleanup action by alleging potential risks to human consumers of fish that have absorbed the contaminants from the streams. (UNF 2000, Website, Community Relations Plan, p. 3, attached as Exhibit I) UNF summarily asserts that 7 of 28 fish sampled had concentrations of lead and cadmium at "'levels considered hazardous to human health,'" and that "extended exposure to these contaminants can lead to health problems in

human beings." (UNF 2000, Website, Community Relations Plan, p. 3, attached as Exhibit I) Significantly, UNF fails to cite any authority for its assertion as to "levels considered hazardous to human health" and fails to identify what constitutes "extended exposure." As to the cadmium, per my conversation with Bob Gese of UNF, UNF has not even determined what concentration levels are "considered hazardous to human health" and has not identified the exposure period that would lead to health problems in human beings. Mr. Gese indicated that there were just too many uncertainties in the toxicological data to be able to confidently establish those threshold concentrations and exposure periods. It is for that reason that the UNF did not impose a threshold bar in its fish/cadmium concentration graph in its Website as it did for lead. As to the lead, again, UNF has not identified the exposure period that would lead to health problems in human beings.

2. Water Quality Impacts are Highly Localized: Water quality impacts are highly localized except in the case of zinc. Even as to the Zinc, although its concentrations exceed Class 3A standards as it exits the Pacific portal, the water in the creek ameliorates to comply with the Class 3A standard a mere 100 feet below the Pacific tailings pile. (KW Brown 1999, Phase II Assessment, p 3, attached as Exhibit J) Moreover, UNF's own studies show that there are very few effects less than a mile down stream, and no evidence of impacts to the Tibble Fork reservoir. (UNF 1994, Preliminary Assessment, attached as Exhibit K)

When UNF looked at this issue back in 1989, its Reclamation Specialist concluded that it was doubtful that the potential improvement in water quality was worth the cost of cleaning up the Pacific mine, and that it did not make sense to initiate a cleanup action due to "the relatively innocuous nature of the problem." (UNF June 7, 1989, Farmer Letter, attached as Exhibit L) Because the water quality impacts are highly localized, the EPA properly concluded back in 1995 (6 years ago) that this drainage was a not a priority; likewise, there is no basis for considering it a priority now. (EPA 1995, Preliminary Assessment Decision, attached as Exhibit A)

3. Re-routing Remedy Would Cure Fish Concerns: Because any such contamination concerns could be cured by simply re-routing the adit drainage around the tailing piles, UNF's proposed cleanup action (moving the tailings to a repository) is unwarranted. As stated above, when UNF looked at this issue back in 1989, its Reclamation Specialist concluded that it was doubtful that potential improvement in water quality would be worth the cost of cleaning up the Pacific mine site, and that it did not make sense to initiate a cleanup action due to, among other things, "the relatively innocuous nature of the problem." Instead of removing the tailing piles, the Reclamation Specialist suggested to the Forest Supervisor that the adit drainage could simply be re-routed around the tailings piles by ditches or pipes. (UNF, June 7, 1989 Farmer letter, attached as Exhibit L) Samples were taken from the North Fork of the American Fork River at sites just upstream and downstream of the Pacific mine disturbance. Downstream of the mine, even applying the inapplicable 4-day, rather than the less stringent 1-hour standard, the only sampled metal that exceeded Class 3A standards for aquatic wildlife was lead (using the appropriate 1-hour standard of 82, the detected level of 15 would satisfy the Class

3A standards). The level of lead could easily be reduced to comply with even the 4-day standard by simply re-routing the drainage away from the tailings piles.

Similarly, when UNF consulted with DOGM in 1990, DOGM's Reclamation Specialist identified two possible alternatives, either 1) route the runoff around the piles, or 2) remove the pile materials to a lower precipitation site. Significantly, the DOGM Reclamation Specialist then recommended against the second alternative of removal because, among other things, it "could aggravate the problems present by introducing oxygen into the system." (DOGM August 7, 1990, letter from Lucia Malin to Paul Skabelund, attached as Exhibit M)

Similarly, when Lidstone and Anderson investigated this issue in detail at the request of UNF, they also concluded that because lead concentrations below the Pacific mine "are primarily tailings related" the problem could be addressed by simply rerouting around the tailings piles. (Lidstone 1993, American Fork Hydrology and Water Quality Study, p. 9, attached as Exhibit E)

Similarly, when DOGM revisited the issue in 1993 after the Lidstone investigation had been completed, DOGM's Reclamation Specialist suggested an adequate mitigation measure would be to simply re-route the adit drainage away form the tailing piles, and, if necessary, recontour, topsoil, and revegetate the piles. (DOGM January 20, 1993 letter from Mark Mesch to Paul Skabelund of UNF, attached as Exhibit N)

C. The Alleged Impairment of Macroinvertebrate Population

1. The Macroinvertebrate Population Justification is Unsupported: UNF also attempts to justify its proposed cleanup action by alleging potential risks of impairment of macroinvertebrate populations sufficient to sustain Brown and Cutthroat trout species. (UNF 2000, Website, Community Relations Plan, p. 3, attached as Exhibit I) As discussed in detail above, the report on UNF's website cites "severe" impacts to aquatic macroinvertebrates, but the supporting data reflects very minor, localized impacts. In summary, 17 of the 18 reported indices fall within the excellent-good-fair range, and only 1 falls within the poor range. (Merrit 1988, attached as Exhibit D; UNF 2000, Website, Macroinvertebrates and Stream Ecological Health, attached as Exhibit G)

2. Water Quality Impacts are Very Localized: See discussion above.

3. Re-routing Would Cure Fish Concerns: See discussion above.

VI. **UNF Should Pursue Those PRPs Who Caused the Contamination**: Snowbird never operated the subject mines sites. Moreover, Snowbird has never owned any of the mineral rights associated with the mines or the subject property. If UNF is going to pursue PRPs other than itself, it would be more equitable to pursue those PRPs who were actually responsible for and benefitted from the mining that caused the contamination rather than Snowbird who never engaged in any mining activity and has never owned any of the mineral rights associated with the subject mine sites.

SUMMARY

In short, while there may be some nominal water quality impairment in the limited immediate vicinity of the Pacific and Dutchman mine sites, the impairment should be considered in the context of the following:

I. The EPA has already concluded that no further remedial action is warranted;
II. The proper CERCLA processes have not been followed;
III. The Forest Service's "time-critical" removal is unwarranted;
IV. The environmental impacts have been mischaracterized;
V. The relative risks do not warrant CERCLA action; and
VI. If UNF goes forward, it should pursue those PRPs who caused the contamination.

UNF's continuing efforts to shoulder Snowbird with the responsibility of cleaning up this historical mining contamination left by other parties is unwarranted , unnecessary and inappropriate. Although Snowbird is not prepared to make a monetary contribution toward UNF's cleanup effort and is not willing to take a significant role in the cleanup work, as a gesture of its good faith and in a spirit of trying to foster the relationship it has tried to nurture with UNF over the last several years, Snowbird installed a fence at the Pacific mine site to minimize the risk of contamination exposure to ATV recreationists as UNF requested. In addition, Snowbird will consider playing a small role in the cleanup work if it can find a discreet component of the work that can be performed without assuming any unreasonable operational or financial burdens.

Documents Reviewed

Reports

Merritt, L.E. 1988. Preliminary Survey of Water Quality in Mine Drainage in Sheeprock Mountains and North Fork of the American Fork River. Provo, Utah. July.

Lidstone and Anderson, Inc. 1992. American Fork Hydrology and Water Quality Study. Prepared for the Utah Division of Oil, Gas and Mining Abandoned Mines Reclamation Program. Fort Collins, CO. Dec. 16.

Forest Service. 1998. Water quality samples on the North Fork of the American Fork River and Mary Ellen Creek. Uinta National Forest website www.fs.fed.us/r4/uinta/afs/afc.index.html.

_____. 1999. Water quality data from the wells installed on the tailings piles at Pacific Mine. Uinta National Forest website www.fs.fed.us/r4/uinta/afs/afc.index.html.

K.W. Brown. 1999. Water quality and soils sampling data. Unpublished data compiled for a Phase II Environmental Site Assessment.

Documents/letters

Forest Service. 1994. Preliminary Assessment of the American Fork Mining district comprised of the Lower Bog Mine, the Pacific Mine, and the Mary Ellen Mines. June. Includes the following documents:

- Ben Albrechten, Forest Service Reclamation Specialist. July 1985. Reclamation Recommendations for Pacific Mine.
- Don Nebeker, Forest Supervisor. March 16, RE: $28,000 under CWA funding to study potential problems at mining related sites.
- Hand-written letter to Paul, no author, no date.
- Eugene Farmer, Forest Service West-wide Reclamation Specialist. June 7, 1989. RE: Site visit and recommendations.
- Lucia Malin, Senior Reclamation Specialist, Division of Oil, Gas and Mining. August 7, 1990. RE: Recommendations for the sites.
- Don Ostler, Director, Bureau of Water Pollution Control. August 8, 1990. RE: Recommendations for the sites.
- Right of Entry Consent for the Pacific Mine for reclamation work. July 9, 1991.
- Participating Agreement between Division of Oil, Gas and Mining and Forest Service to do reclamation and the Pacific Mine. September 27, 1991.
- Craig Haase, Executive Vice President, Euro-Nev Mining. October 4, 1991. Re: Reclamation at the Pacific Mine.
- Mark Mesch, Division of Oil, Gas and Mining. May 8, 2000. Scope of Work at the Pacific Mine.
- Mark Mesch, Division of Oil, Gas and Mining. January 20, 1993. Summarizes the Lidstone and Anderson report.

Ursula Tureman, Superfund Branch Manager, Utah Division of Environmental Response and Remediation. November 22, 1991. Re: Request CERCLIS status.

Paul Skabelund, Forest Service Forester. May 15, 1989. Re: Summarizes sampling findings at the 3 mines.

U.S. EPA. September 12, 1995. Preliminary Assessment Decision.

Forest Service. August 24, 1998. RE: Notice of potential PRP under the authority of CERCLA 42 U.S.C. Sec. 9604, Federal Executive Order 12580 as amended, and C.F.R. 2.60(a)(40).

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EPA ID NO. / LATITUDE / LONGITUDE	NPL/ NON-NPL / NFRAP	SITE NAME / STREET / CITY / COUNTY CODE & NAME	STATE	ZIP	OPERABLE UNIT	EVENT TYPE	EVENT QUALIFIER	ACTUAL START DATE	ACTUAL COMPLETE DATE	CURRENT EVENT LEAD
UTD988074951 4032300 11135500	NON-NPL NFRA	AMERICAN FORK CANYON/UINTA NATIONAL PLEASANT GROVE PLEASANT GROVE 049 UTAH	UT	84601			THE SITE CONSISTS OF THREE KNOWN MINES INCLUDING PACIFIC MINE, THE MARY ELLEN MINE, AND THE LOWER BOG MINE. THERE IS ALLEGED CONTAMINATION OF SURFACE WATER IN A HEAVILY USED FISHERY DUE TO MINING ACTIVITY.			
					00	DS1			01/24/92	FEDERAL FACILITY
					00	PA1	NO FURTHER REMEDIAL ACTION PLANNED		09/12/95	FEDERAL FACILITY
UT1141193002 4017300 11216300	NON-NPL NFA	BLM - MERCUR CANON OUTWASH HIGHWAY 73, EAST OF TOOELE ARMY DEPOT TOOELE 045 TOOELE	UT	84074						
					00	DS1			09/27/91	FEDERAL FACILITY
					00	PA1	NO FURTHER REMEDIAL ACTION PLANNED		09/21/93	FEDERAL FACILITY
					00	SI1	NO FURTHER REMEDIAL ACTION PLANNED		09/21/93	FEDERAL FACILITY
UT0141193003 4157480 11242420	NON-NPL NFA	BLM - SNOWVILLE LANDFILL T14N, R9W, SEC 32 SNOWVILLE 003 BOX ELDER	UT	84336						
					00	DS1			12/15/89	FEDERAL FACILITY
					00	PA1	NO FURTHER REMEDIAL ACTION PLANNED		09/27/93	FEDERAL FACILITY

PRELIMINARY ASSESSMENT DECISION - EPA REGION VIII

Site Name: AMERICAN FORK CANYON EPA ID#: UTD 982 074951

Alias Site Names: -

City: UINTA NAT'L FOREST, UT County or Parish: State:

Refer to Report Dated: JUNE 1994 Report developed by: US Forest Service

The purpose of this sheet is to document the decision made at the conclusion of a Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Preliminary Assessment (PA) with respect to future actions to be taken at the site. The PA is designed to distinguish between sites that pose little or no threat to human health and the environment and sites that require further investigation. As a result of the PA, if it is determined that a site has the potential to achieve a Hazard Ranking Score (HRS) equal to or greater than 28.5 then the site will be assigned a "higher" or "lower" priority for a Site Inspection. If the site is determined to achieve a HRS score less than 28.5 then the site will be given the disposition of "No Further Remedial Action Planned" (NFRAP). Because of the inherent difficulties in evaluating a site under the HRS on the amount of information provided in a PA, the following qualitative factors will be used as a measure for assessment.

(CHECK ALL THAT APPLY)

WASTE TYPE	NATURE OF RELEASE
___ KNOWN LISTED HAZARDOUS SUBSTANCE	✓ OBSERVED OR DOCUMENTED
✓ SUSPECTED HAZARDOUS SUBSTANCES	___ SUSPECTED
___ CERCLA - EXEMPT WASTE	___ UNKNOWN
___ UNKNOWN	___ NONE/FULLY CONTAINED
___ NONE/NO LONGER ON SITE	

TARGETS/RECEPTORS	
✓ KNOWN	✓ POTENTIAL
HUMAN	HUMAN
___ INHALATION	___ INHALATION
___ DRINKING WATER	___ DRINKING WATER
___ FOOD CHAIN/FISHERIES	✓ FOOD CHAIN/FISHERIES
___ ON-SITE (circle Workers and/or Residents)	___ ON-SITE (circle Workers and/or Residents)
___ NONE	___ UNKNOWN
ENVIRONMENTAL	ENVIRONMENTAL
___ SENSITIVE ENVIRONMENT	___ SENSITIVE ENVIRONMENT
___ SENSITIVE HABITAT	___ SENSITIVE HABITAT
___ TERRESTRIAL SENSITIVE	___ TERRESTRIAL SENSITIVE
___ NONE	___ UNKNOWN

	HIGHER PRIORITY QUALIFIER	LOWER PRIORITY QUALIFIER
HRS CANDIDATE	-Level I or II likely -Large waste quantity where targets exist -Large potential targets where there is poor containment and/or high likelihood to release	-Potential targets where waste is present -Waste characteristics are moderate to weak but where targets are present -Weak containment/moderate likelihood to release where targets are present

NO FURTHER REMEDIAL ACTION PLANNED (NFRAP)	
NOT A HRS CANDIDATE	-No waste present or -Full containment or -Full removal or -No targets within HRS proximity

DECISION:

✓ NO FURTHER REMEDIAL ACTION PLANNED (NFRAP) - Site does not qualify for further assessment under CERCLA.

____ DEFERRED - Site may qualify for further action, but is deferred to: ____ RCRA subtitle C permit ____ NRC (Federal License)

FURTHER ASSESSMENT NEEDED:

____ HIGHER PRIORITY - Immediate Site Inspection required as soon as possible—site established as a higher threat

____ LOWER PRIORITY - Site Inspection required—site established as a lower threat

DISCUSSION/RATIONALE:

Mine wastes from small operations in Uinta Nat'l Forest. Locations are accessible only for recreational purposes.

Report Reviewed and Approved by: VERA MORITZ Signature: V Moritz Date: 9/12/95

Site Decision Made by: VERA MORITZ Signature: V Moritz Date: 9/12/95

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Executive Order 12579 of December 31, 1986

President's Advisory Committee on Mediation and Conciliation

52 F.R. 515

By the authority vested in me as President by the Constitution and laws of the United States of America, including the Federal Advisory Committee Act, as amended (5 U.S.C. App. I), and in order to extend the life of the President's Advisory Committee on Mediation and Conciliation, it is hereby ordered that Section 4(b) of Executive Order No. 12462[2] of February 17, 1984, as amended, is further amended to read: "The Committee shall terminate on December 31, 1987, unless sooner extended."

Ronald Reagan

THE WHITE HOUSE,
December 31, 1986.

2. 1984 U.S.Code Cong. & Adm. News Bd. Vol. page B12.

Executive Order 12580 of January 23, 1987

Superfund Implementation

52 F.R. 2923

By the authority vested in me as President of the United States of America by Section 115 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (42 U.S.C. 9615 *et seq.*) ("the Act"), and by Section 301 of Title 3 of the United States Code, it is hereby ordered as follows:

Section 1. *National Contingency Plan.* (a)(1) The National Contingency Plan ("the NCP"), shall provide for a National Response Team ("the NRT") composed of representatives of appropriate Federal departments and agencies for national planning and coordination of preparedness and response actions, and regional response teams as the regional counterpart to the NRT for planning and coordination of regional preparedness and response actions.

(2) The following agencies (in addition to other appropriate agencies) shall provide representatives to the National and Regional Response Teams to carry out their responsibilities under the NCP: Department of State, Department of Defense, Department of Justice, Department of the Interior, Department of Agriculture, Department of Commerce, Department of Labor, Department of Health and Human Services, Department of Transportation, Department of Energy, Environmental Protection Agency, Federal Emergency Man-

agement Agency, United States Coast Guard, and the Nuclear Regulatory Commission.

(3) Except for periods of activation because of a response action, the representative of the Environmental Protection Agency ("EPA") shall be the chairman and the representative of the United States Coast Guard shall be the vice chairman of the NRT and these agencies' representatives shall be co-chairs of the Regional Response Teams ("the RRTs"). When the NRT or an RRT is activated for a response action, the chairman shall be the EPA or United States Coast Guard representative, based on whether the release or threatened release occurs in the inland or coastal zone, unless otherwise agreed upon by the EPA and United States Coast Guard representatives.

(4) The RRTs may include representatives from State governments, local governments (as agreed upon by the States), and Indian tribal governments. Subject to the functions and authorities delegated to Executive departments and agencies in other sections of this Order, the NRT shall provide policy and program direction to the RRTs.

(b)(1) The responsibility for the revision of the NCP and all of the other functions vested in the President by Sections 105(a), (b), (c), and (g), 125, and 301(f) of the Act is delegated to the Administrator of the Environmental Protection Agency ("the Administrator").

(2) The function vested in the President by Section 118(p) of the Superfund Amendments and Reauthorization Act of 1986 (Public Law 99-499) ("SARA") is delegated to the Administrator.

(c) In accord with Section 107(f)(2)(A) of the Act and Section 311(f)(5) of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1321(f)(5)), the following shall be among those designated in the NCP as Federal trustees for natural resources:

(1) Secretary of Defense;

(2) Secretary of the Interior;

(3) Secretary of Agriculture;

(4) Secretary of Commerce;

(5) Secretary of Energy.

(d) Revisions to the NCP shall be made in consultation with members of the NRT prior to publication for notice and comment. Revisions shall also be made in consultation with the Director of the Federal Emergency Management Agency and the Nuclear Regulatory Commission in order to avoid inconsistent or duplicative requirements in the emergency planning responsibilities of those agencies.

(e) All revisions to the NCP, whether in proposed or final form, shall be subject to review and approval by the Director of the Office of Management and Budget ("OMB").

Sec. 2. *Response and Related Authorities.* (a) The functions vested in the President by the first sentence of Section 104(b)(1) of the Act relating to "illness, disease, or complaints thereof" are delegated to the Secretary of

Health and Human Services who shall, in accord with Section 104(i) of the Act, perform those functions through the Public Health Service.

(b) The functions vested in the President by Sections 104(e)(7)(C), 113(k)(2), 119(c)(7), and 121(f)(1) of the Act, relating to promulgation of regulations and guidelines, are delegated to the Administrator, to be exercised in consultation with the NRT.

(c)(1) The functions vested in the President by Sections 104(a) and the second sentence of 126(b) of the Act, to the extent they require permanent relocation of residents, businesses, and community facilities or temporary evacuation and housing of threatened individuals not otherwise provided for, are delegated to the Director of the Federal Emergency Management Agency.

(2) Subject to subsection (b) of this Section, the functions vested in the President by Sections 117(a) and (c), and 119 of the Act, to the extent such authority is needed to carry out the functions delegated under paragraph (1) of this subsection, are delegated to the Director of the Federal Emergency Management Agency.

(d) Subject to subsections (a), (b) and (c) of this Section, the functions vested in the President by Sections 104(a), (b) and (c)(4), 113(k), 117(a) and (c), 119, and 121 of the Act are delegated to the Secretaries of Defense and Energy, with respect to releases or threatened releases where either the release is on or the sole source of the release is from any facility or vessel under the jurisdiction, custody or control of their departments, respectively, including vessels bare-boat chartered and operated. These functions must be exercised consistent with the requirements of Section 120 of the Act.

(e)(1) Subject to subsections (a), (b), (c), and (d) of this Section, the functions vested in the President by Sections 104(a), (b), and (c)(4), and 121 of the Act are delegated to the heads of Executive departments and agencies, with respect to remedial actions for releases or threatened releases which are not on the National Priorities List ("the NPL") and removal actions other than emergencies, where either the release is on or the sole source of the release is from any facility or vessel under the jurisdiction, custody or control of those departments and agencies, including vessels bare-boat chartered and operated. The Administrator shall define the term "emergency", solely for the purposes of this subsection, either by regulation or by a memorandum of understanding with the head of an Executive department or agency.

(2) Subject to subsections (b), (c), and (d) of this Section, the functions vested in the President by Sections 104(b)(2), 113(k), 117(a) and (c), and 119 of the Act are delegated to the heads of Executive departments and agencies, with respect to releases or threatened releases where either the release is on or the sole source of the release is from any facility or vessel under the jurisdiction, custody or control of those departments and agencies, including vessels bare-boat chartered and operated.

(f) Subject to subsections (a), (b), (c), (d), and (e) of this Section, the functions vested in the President by Sections 104(a), (b) and (c)(4), 113(k), 117(a) and (c), 119, and 121 of the Act are delegated to the Secretary of the Department in which the Coast Guard is operating ("the Coast Guard"), with respect to any release or threatened release involving the coastal zone, Great Lakes waters, ports, and harbors.

(g) Subject to subsections (a), (b), (c), (d), (e), and (f) of this Section, the functions vested in the President by Sections 101(24), 104(a), (b), (c)(4) and (c)(9), 113(k), 117(a) and (c), 119, 121, and 126(b) of the Act are delegated to the Administrator. The Administrator's authority under Section 119 of the Act is retroactive to the date of enactment of SARA.

(h) The functions vested in the President by Section 104(c)(3) of the Act are delegated to the Administrator, with respect to providing assurances for Indian tribes, to be exercised in consultation with the Secretary of the Interior.

(i) Subject to subsections (d), (e), (f), (g) and (h) of this Section, the functions vested in the President by Section 104(c) and (d) of the Act are delegated to the Coast Guard, the Secretary of Health and Human Services, the Director of the Federal Emergency Management Agency, and the Administrator in order to carry out the functions delegated to them by this Section.

(j)(1) The functions vested in the President by Section 104(e)(5)(A) are delegated to the heads of Executive departments and agencies, with respect to releases or threatened releases where either the release is on or the sole source of the release is from any facility or vessel under the jurisdiction, custody or control of those departments and agencies, to be exercised with the concurrence of the Attorney General.

(2) Subject to subsection (b) of this Section and paragraph (1) of this subsection, the functions vested in the President by Section 104(e) are delegated to the heads of Executive departments and agencies in order to carry out their functions under this Order or the Act.

(k) The functions vested in the President by Section 104(f), (g), (h), (i)(11), and (j) of the Act are delegated to the heads of Executive departments and agencies in order to carry out the functions delegated to them by this Section. The exercise of authority under Section 104(h) of the Act shall be subject to the approval of the Administrator of the Office of Federal Procurement Policy.

Sec. 3. *Cleanup Schedules.* (a) The functions vested in the President by Sections 116(a) and the first two sentences of 105(d) of the Act are delegated to the heads of Executive departments and agencies with respect to facilities under the jurisdiction, custody or control of those departments and agencies.

(b) Subject to subsection (a) of this Section, the functions vested in the President by Sections 116 and 105(d) are delegated to the Administrator.

Sec. 4. *Enforcement.* (a) The functions vested in the President by Sections 109(d) and 122(e)(3)(A) of the Act, relating to development of regulations and guidelines, are delegated to the Administrator, to be exercised in consultation with the Attorney General.

(b)(1) Subject to subsection (a) of this Section, the functions vested in the President by Section 122 (except subsection (b)(1)) are delegated to the heads of Executive departments and agencies, with respect to releases or threatened releases not on the NPL where either the release is on or the sole source of the release is from any facility under the jurisdiction, custody or control of those Executive departments and agencies. These functions may be exercised only with the concurrence of the Attorney General.

(2) Subject to subsection (a) of this Section, the functions vested in the President by Section 109 of the Act, relating to violations of Section 122 of the

Act, are delegated to the heads of Executive departments and agencies, with respect to releases or threatened releases not on the NPL where either the release is on or the sole source of the release is from any facility under the jurisdiction, custody or control of those Executive departments and agencies. These functions may be exercised only with the concurrence of the Attorney General.

(c)(1) Subject to subsection (a) and (b)(1) of this Section, the functions vested in the President by Sections 106(a) and 122 of the Act are delegated to the Coast Guard with respect to any release or threatened release involving the coastal zone, Great Lakes waters, ports, and harbors.

(2) Subject to subsection (a) and (b)(2) of this Section, the functions vested in the President by Section 109 of the Act, relating to violations of Sections 103 (a) and (b), and 122 of the Act, are delegated to the Coast Guard with respect to any release or threatened release involving the coastal zone, Great Lakes waters, ports, and harbors.

(d)(1) Subject to subsections (a), (b)(1), and (c)(1) of this Section, the functions vested in the President by Sections 106 and 122 of the Act are delegated to the Administrator.

(2) Subject to subsections (a), (b)(2), and (c)(2) of this Section, the functions vested in the President by Section 109 of the Act, relating to violations of Sections 103 and 122 of the Act, are delegated to the Administrator.

(e) Notwithstanding any other provision of this Order, the authority under Sections 104(e)(5)(A) and 106(a) of the Act to seek information, entry, inspection, samples, or response actions from Executive departments and agencies may be exercised only with the concurrence of the Attorney General.

Sec. 5. *Liability.* (a) The function vested in the President by Section 107(c)(1)(C) of the Act is delegated to the Secretary of Transportation.

(b) The functions vested in the President by Section 107(c)(3) of the Act are delegated to the Coast Guard with respect to any release or threatened release involving the coastal zone, Great Lakes waters, ports, and harbors.

(c) Subject to subsection (b) of this Section, the functions vested in the President by Section 107(c)(3) of the Act are delegated to the Administrator.

(d) The functions vested in the President by Section 107(f)(1) of the Act are delegated to each of the Federal trustees for natural resources designated in the NCP for resources under their trusteeship.

(e) The functions vested in the President by Section 107(f)(2)(B) of the Act, to receive notification of the state natural resource trustee designations, are delegated to the Administrator.

Sec. 6. *Litigation.* (a) Notwithstanding any other provision of this Order, any representation pursuant to or under this Order in any judicial proceedings shall be by or through the Attorney General. The conduct and control of all litigation arising under the Act shall be the responsibility of the Attorney General.

(b) Notwithstanding any other provision of this Order, the authority under the Act to require the Attorney General to commence litigation is retained by the President.

(c) The functions vested in the President by Section 113(g) of the Act, to receive notification of a natural resource trustee's intent to file suit, are delegated to the heads of Executive departments and agencies with respect to response actions for which they have been delegated authority under Section 2 of this Order. The Administrator shall promulgate procedural regulations for providing such notification.

(d) The functions vested in the President by Sections 310 (d) and (e) of the Act, relating to promulgation of regulations, are delegated to the Administrator.

Sec. 7. *Financial Responsibility.* (a) The functions vested in the President by Section 107(k)(4)(B) of the Act are delegated to the Secretary of the Treasury. The Administrator will provide the Secretary with such technical information and assistance as the Administrator may have available.

(b)(1) The functions vested in the President by Section 108(a)(1) of the Act are delegated to the Coast Guard.

(2) Subject to Section 4(a) of this Order, the functions vested in the President by Section 109 of the Act, relating to violations of Section 108(a)(1) of the Act, are delegated to the Coast Guard.

(c)(1) The functions vested in the President by Section 108(b) of the Act are delegated to the Secretary of Transportation with respect to all transportation related facilities, including any pipeline, motor vehicle, rolling stock, or aircraft.

(2) Subject to Section 4(a) of this Order, the functions vested in the President by Section 109 of the Act, relating to violations of Section 108(a)(3) of the Act, are delegated to the Secretary of Transportation.

(3) Subject to Section 4(a) of this Order, the functions vested in the President by Section 109 of the Act, relating to violations of Section 108(b) of the Act, are delegated to the Secretary of Transportation with respect to all transportation related facilities, including any pipeline, motor vehicle, rolling stock, or aircraft.

(d)(1) Subject to subsection (c)(1) of this Section, the functions vested in the President by Section 108 (a)(4) and (b) of the Act are delegated to the Administrator.

(2) Subject to Section 4(a) of this Order and subsection (c)(3) of this Section, the functions vested in the President by Section 109 of the Act, relating to violations of Section 108 (a)(4) and (b) of the Act, are delegated to the Administrator.

Sec. 8. *Employee Protection and Notice to Injured.* (a) The functions vested in the President by Section 110(e) of the Act are delegated to the Adminstrator.

(b) The functions vested in the President by Section 111(g) of the Act are delegated to the Secretaries of Defense and Energy with respect to releases from facilities or vessels under the jurisdiction, custody or control of their departments, respectively, including vessels bare-boat chartered and operated.

(c) Subject to subsection (b) of this Section, the functions vested in the President by Section 111(g) of the Act are delegated to the Administrator.

Sec. 9. *Management of the Hazardous Substance Superfund and Claims.* (a) The functions vested in the President by Section 111(a) of the Act are delegated to the Administrator, subject to the provisions of this Section and other applicable provisions of this Order.

(b) The Administrator shall transfer to other agencies, from the Hazardous Substance Superfund out of sums appropriated, such amounts as the Administrator may determine necessary to carry out the purposes of the Act. These amounts shall be consistent with the President's Budget, within the total approved by the Congress, unless a revised amount is approved by OMB. Funds appropriated specifically for the Agency for Toxic Substances and Disease Registry ("ATSDR"), shall be directly transferred to ATSDR, consistent with fiscally responsible investment of trust fund money.

(c) The Administrator shall chair a budget task force composed of representatives of Executive departments and agencies having responsibilities under this Order or the Act. The Administrator shall also, as part of the budget request for the Environmental Protection Agency, submit to OMB a budget for the Hazardous Substance Superfund which is based on recommended levels developed by the budget task force. The Administrator may prescribe reporting and other forms, procedures, and guidelines to be used by the agencies of the Task Force in preparing the budget request, consistent with budgetary reporting requirements issued by OMB. The Administrator shall prescribe forms to agency task force members for reporting the expenditure of funds on a site specific basis.

(d) The Administrator and each department and agency head to whom funds are provided pursuant to this Section, with respect to funds provided to them, are authorized in accordance with Section 111(f) of the Act to designate Federal officials who may obligate such funds.

(e) The functions vested in the President by Section 112 of the Act are delegated to the Administrator for all claims presented pursuant to Section 111 of the Act.

(f) The functions vested in the President by Section 111(o) of the Act are delegated to the Administrator.

(g) The functions vested in the President by Section 117(e) of the Act are delegated to the Administrator, to be exercised in consultation with the Attorney General.

(h) The functions vested in the President by Section 123 of the Act are delegated to the Administrator.

(i) Funds from the Hazardous Substance Superfund may be used, at the discretion of the Administrator or the Coast Guard, to pay for removal actions for releases or threatened releases from facilities or vessels under the jurisdiction, custody or control of Executive departments and agencies but must be reimbursed to the Hazardous Substance Superfund by such Executive department or agency.

Sec. 10. *Federal Facilities.* (a) When necessary, prior to selection of a remedial action by the Administrator under Section 120(e)(4)(A) of the Act, Executive agencies shall have the opportunity to present their views to the Administrator after using the procedures under Section 1-6 of Executive Order No. 12088

of October 13, 1978, or any other mutually acceptable process. Notwithstanding subsection 1–602 of Executive Order No. 12088, the Director of the Office of Management and Budget shall facilitate resolution of any issues.

(b) Executive Order No. 12088[3] of October 13, 1978, is amended by renumbering the current Section 1–802 as Section 1–803 and inserting the following new Section 1–802:

"1–802. Nothing in this Order shall create any right or benefit, substantive or procedural, enforceable at law by a party against the United States, its agencies, its officers, or any person."

Sec. 11. *General Provisions.* (a) The function vested in the President by Section 101(37) of the Act is delegated to the Administrator.

(b)(1) The function vested in the President by Section 105(f) of the Act, relating to reporting on minority participation in contracts, is delegated to the Administrator.

(2) Subject to paragraph 1 of this subsection, the functions vested in the President by Section 105(f) of the Act are delegated to the heads of Executive departments and agencies in order to carry out the functions delegated to them by this Order. Each Executive department and agency shall provide to the Administrator any requested information on minority contracting for inclusion in the Section 105(f) annual report.

(c) The functions vested in the President by Section 126(c) of the Act are delegated to the Administrator, to be exercised in consultation with the Secretary of the Interior.

(d) The functions vested in the President by Section 301(c) of the Act are delegated to the Secretary of the Interior.

(e) Each agency shall have authority to issue such regulations as may be necessary to carry out the functions delegated to them by this Order.

(f) The performance of any function under this Order shall be done in consultation with interested Federal departments and agencies represented on the NRT, as well as with any other interested Federal agency.

(g) The following functions vested in the President by the Act which have been delegated or assigned by this Order may be redelegated to the head of any Executive department or agency with his consent: functions set forth in Sections 2 (except subsection (b)), 3, 4(b), 4(c), 4(d), 5(b), 5(c), and 8(c) of this Order.

(h) Executive Order No. 12316[4] of August 14, 1981, is revoked.

Ronald Reagan

THE WHITE HOUSE,
January 23, 1987.

3. 42 U.S.C.A. § 4321 nt.
4. 42 U.S.C.A. § 9615 nt.

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Sections 104(a) and (b) also authorize responses and studies regarding releases and threatened releases of pollutants or contaminants which present an imminent and substantial danger to human health or welfare.

2.1.C Authority

Section 104(a) of CERCLA authorizes the President to act, consistent with the National Contingency Plan (NCP), to remove or to arrange for the removal of any hazardous substance, pollutant, or contaminant if the President deems it necessary to protect the public health, welfare, or the environment. Section 104(b) of CERCLA authorizes studies and investigations and section 106 of CERCLA authorizes the President to order measures necessary to abate imminent and substantial endangerment to public health, welfare, or the environment because of an actual or threatened release of a hazardous substance. Section 106 also sets forth fines for any person who, without sufficient cause, willfully violates or fails/refuses to comply with a section 106 order. Specific standards and procedures for implementing CERCLA and for conforming to other statutes are set forth in the NCP.

2.1.D Types of Removals

EPA has classified removals into the following three categories based upon the site evaluation and the urgency of the situation:

- **Emergencies** - removals where the release, or threatened release, requires that on-site cleanup activities begin within hours of the lead agency's determination that a removal action is appropriate.
- **Time-Critical** - removals where, based on the site evaluation, the lead agency determines that a removal action is appropriate and that there is a period of less than six months available before cleanup activities must begin on site.
- **Non-Time-Critical (NTC)** - removals where, based on the site evaluation, the lead agency determines that a removal action is appropriate and that there is a planning period of more than six months available before on-site activities must begin. The lead agency must undertake an Engineering Evaluation/Cost Analysis (EE/CA), or its equivalent, for NTC removals.

The urgency determination influences the amount of time that can be devoted to a PRP search prior to on-site action, negotiation length, the type and timing of public participation, whether an EE/CA must be conducted, and the extent of compliance with other environmental statutes.

2.1.E Removal Activities

According to section 101(23) of CERCLA and section 300.415 of the NCP, the response activities listed below may be appropriate removal actions in certain situations. To the greatest extent possible, all removal activities should be designed to reduce risk to human health and the environment. This list is intended neither to limit response officials from taking other actions deemed necessary under the circumstances, nor to preclude the lead agency from referring response actions to other appropriate federal or state enforcement authorities.

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B2

<<TOC>> **Environmental Review Requirements for Removal Actions**
ENVIRES REF #: PA085

DOCUMENT: Memorandum - OSWER 9318.0-05 (Supercedes 9360.0-11)

DATE ISSUED: 4/13/87

LAW AND SECTION: SARA, CERCLA

REGULATION:

U S CODE:

DATE EXPIRED:

REPLACED BY:

TEXT:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

APR 13 1987

OFFICE OF MEMORANDUM SOLID WASTE AND EMERGENCY RESPONSE

SUBJECT: Policy on "**Environmental Review Requirements for Removal Actions**" (OSWER Directive # 9318.0-05)

FROM: Henry L. Longest II, Director /s/
Office of Emergency and Remedial Response

TO: Waste Management Division Directors, Regions I-X Environmental Services Division Directors, Regions I, VI, and VII

Attached is a policy articulating the removal program's strategy for meeting the requirements of the National Environmental Policy Act (NEPA). The policy has been developed in consultation with the Office of General Counsel and meets the legal requirements for complying with NEPA. Additionally, Regional and OERR comments were solicited and incorporated into the policy, and coordination was obtained from Headquarters Office of Waste Programs Enforcement and Office of Enforcement and Compliance Monitoring to assure consistency with proposed requirements For the removal administrative record, pursuant to SARA 113(k)-(2).

In discussing environmental review requirements for removals, this policy introduces the definition of time-critical and non-time-critical removal actions. A major portion oF this policy addresses compliance with NEPA for non-time-critical removal actions, and in this context introduces the concept of Engineering Evaluations/Cost Analyses (EE/CAs). The purpose of and procedures for preparing EE/CAs are addressed in other guidance that is now being developed in the Emergency Response Division. That guidance not only defines the specific analysis that will be done in an EE/CA for non-time-critical removals, but also stipulates how this requirement is met for classic emergencies and time-critical removal actions. In general, for these latter types of removals, a slight expansion of current removal documentation requirements (i.e., Action Memos, POLREPS, OSC Reports, and other removal program documents) will serve the purpose of the EE/CA. A separate EE/CA document need not he generated in these cases.

Any questions on the implementation of this policy should be directed to Cheryl Hawkins (FTS 382-5650).

Attachment

cc: Tim Fields, ERD
Russ Wyer, HSCD
Stephen Lingle, HRSO

Karen Clark, OGC
Dabble Wolpe, OWPE
Ellen Spitalnik, OECM
Cheryl Hawkins, ERD
OHM Coordinators, Regions I-X
Superfund Branch Chiefs, Regions I-X

ATTACHMENT

OSWER DIR. #9318.0-05

ENVIRONMENTAL REVIEW REQUIREMENTS FOR REMOVAL ACTIONS

ISSUE

Under the current National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (November 20, 1985), the definition of removals has been expanded to include all activities formerly considered immediate and planned removals, as well as initial remedial measures (IRMs). In addition, removal actions may be taken in response to a "threat" rather than being limited to an "immediate and significant" threat. As a result of these changes, removal actions may now be undertaken in less urgent situations than previously. Because longer lead-time will be available for some removal actions, this extension of removal authority raises the question of whether certain removal actions should be subject to a formal environmental review and comment period.

BACKGROUND

The National Environmental Policy Act (NEPA requires every Federal agency to incorporate the consideration of environmental factors into its decision-making process. Specifically, NEPA requires Federal agencies "to the fullest extent possible" to prepare an Environmental Impact Statement (EIS) for all "major Federal actions significantly affecting the quality of the human environment." The EIS must include consideration of alternative actions, analysis of the environmental impact of the proposed actions, and an opportunity for public comment. /*/

/*/ Section 113(k)(1) and (k)(2)(A) of SARA set forth requirements for establishment of an administrative record upon which EPA will base the selection of removal actions and provide for participation of interested parties in the development of this administrative record. This OSWER Directive applies to NEPA requirements and is not meant to address these SARA requirements.

An exemption for Federal agency actions has been recognized by the courts in situations where compliance with EIS requirements would result in a "clear and unavoidable conflict" with the purpose or procedures of the agency's authorizing statute. This exemption has been applied to cases where it would be impossible for an agency to adhere to the formal EIS process and at the same time comply with a requirement for prompt action, such as that mandated by EPA's removal authority under CERCLA.

Under the former NCP (July 16, 1982), removal actions were divided into two categories -- immediate removals and planned removals. Immediate removals were undertaken where immediate response was necessary to prevent significant harm to human health or the environment. Planned removals were undertaken where an expedited, although not necessarily immediate, response was necessary. Due to the focus of immediate and planned removals on emergency and near-emergency situations; removal actions were not subject to NEPA EIS requirements on the grounds that the CERCLA requirements for prompt action in such cases conflicted with the EIS process mandated by NEPA.

With the expanded removal authority in the current NCP, however, some removal actions may be undertaken in less urgent situations than was previously possible. In such situations, the exemption from EIS requirements based on a CERCLA mandate for prompt action would not be applicable

Accordingly, the purpose of this paper is to: 1) define which removal actions will require an environmental review and public comment period; 2) describe the mechanisms that may be used to provide an adequate review; and 3) recommend a strategy for implementation. (NOTE: Fulfillment of NEPA requirements in the remedial program is achieved through public review of the Remedial Investigation/Feasibility Study, which serves as a functional equivalent of an environmental impact statement.)

DEFINITIONS

For purposes of compliance with NEPA requirements, the following categories of removal action are defined:

1. Classic Emergency Removal Actions are actions initiated in response to a release or threat of release that poses a risk to public health or welfare or the environment, such that the OSC determines that cleanup or stabilization actions must be initiated within hours or days after completion of the preliminary assessment. The emergency nature of the response is unrelated to the cost or duration of the response. Such actions could include, but are not limited to, response to a fire in a chemical warehouse, response to a tanker truck accident that releases hazardous substances, of response to leaking drums that pose an explosion hazard.

2. Time-Critical Removal Actions are actions initiated in response to a release or threat of release that poses a risk to public health or welfare or the environment, such that cleanup or stabilization actions must be initiated within six months following approval of the action memo. The time-criticality of the response is unrelated to the cost or duration of the response. Classic Emergencies are not included in this category. This six-month time frame within which response must be initiated is based upon the determination that a threat exists that must be addressed within six months. This determination is independent of the question of resource or contractor availability to actually commence the action within that time frame, or delays due to unexpected weather conditions, etc. Thus, if initiation of a time-critical action is delayed past six months for these reasons, it is still considered time-critical for purposes of NEPA compliance. Examples include response to an industrial site in a residential area containing open tanks of hazardous substances and spilled materials, response to a facility containing eroding unlined waste lagoons, or response to an unregulated waste dump containing scattered piles of deteriorating drums.

3. Non-Time-Critical Removal Actions are actions initiated in response to a release or threat of release that poses a risk to public health or welfare or the environment, such that initiation of removal cleanup or stabilization actions may be delayed for six months or more following approval of the action memo. The time-criticality of the response is unrelated to the cost

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or duration of the response. An example of a Non-Time-Critical Removal Action might be response to an abandoned industrial dump, isolated from public access, which poses a potential threat to ground water if not cleaned up. Cleanup may also be delayed in situations where hazardous substances have been abandoned on a site, but the substances are in stable containers and secured from public access. A final example might be an NPL site where containers are stable now, but expected to deteriorate prior to the time that the remedial program can start action. The two primary considerations in determining whether site

response can be delayed are the stability of the wastes and the potential for public contact with the wastes. (NOTE: All expedited response actions, ERAs, are non-time-critical by definition.)

Application Of Definitions: Classic Emergency and Time-Critical Removal Actions are exempt from compliance with EIS requirements based on statutory conflict (i.e., the CERCLA directive for prompt action). Non-Time-Critical Removal Actions require environmental review and public comment. However, any emergency or time-critical threat that arises during the conduct of a non-time-critical removal is exempt from NEPA analysis and review requirements.

ENVIRONMENTAL REVIEW MECHANISMS

The removal program may use two mechanisms to provide consideration of environmental factors in Non-Time-Critical Removal Actions: 1) performing an environmental review as part of the Engineering Evaluation/Cost Analysis; and 2) declaring a Generic Exclusion for certain types of actions.

1. Engineering Evaluation/Cost Analysis. The courts have developed an exception to the EIS requirement for EPA where the agency achieves the NEPA objective of full consideration and disclosure of environmental effects. This exemption is commonly known as the "functional equivalency" exemption.

The Emergency Response Division (ERD) is currently developing procedures for conducting an Engineering Evaluation and Cost Analysis (EE/CA), which will meet the requirements of functional equivalency for the purposes of NEPA. Essentially, the EE/CA will be an analysis of alternatives that documents the reasons for choosing the proposed Non-Time-Critical Removal Action. The project cost, project complexity, and the maturity of the removal technologies considered will be factors in determining the extent of the analysis. The scope of the EE/CA will correspond to the scope of the project.

For Non-Time-Critical Removal Actions, the EE/CA will include the following:

Site characterization

Identification of response objectives
- Including consideration of "contribution to remedial performance"

Identification of removal response alternatives

Initial screening of alternatives based on four factors:
- Is the option timely with respect to release mitigation and program goals?
- Is the option protective of human health and the environment?
- Is the option technically feasible?
- Are there any major institutional considerations (e.g., access agreements, zoning)?

Analysis of remaining alternatives based on four selection criteria:
- Technical feasibility
- Reasonable cost
- Institutional considerations
- Environmental impacts

Recommended removal action

Opportunity for public comment (21 days).

EPA will respond to public comments on EE/CAs for Non-Time-Critical Removal Actions by means of a responsiveness summary. Details on the responsiveness summary will be included in future removal guidance.

Thus, for removal actions where there is sufficient time before the action will start, an analysis of environmental impacts will be performed that is comparable to a NEPA review and in proportion to the scope of the project. Separate guidance on EE/CAS, now being developed, will detail the contents of the NEPA review. Public participation requirements are detailed in the April 1987 revision to the OERR Community Relations Handbook (OSWER Dir. #9230.0-3B). Community relations staff in Regional offices will be available to assist in community relations activities.

2. Generic Exclusions. EPA may determine that certain actions taken within Non-Time-Critical Removal Actions do not require extensive environmental review if those actions do not individually, cumulatively, over time or in conjunction with other Federal, State, local or private actions have a significant effect on the quality of the human environment. Removal actions would not be eligible for Generic Exclusions if any of the following are true:

The action may involve serious local or environmental issues.

The action will create a new discharge, or move an existing discharge to another environmental media.

The action is known or expected to have a significant effect on the quality of the human environment.

The action is known or expected to directly or indirectly affect cultural resource areas such as archeological or historic sites; habitats of endangered or threatened species; environmentally important natural resources such as floodplains, wetlands, important farmlands, or acquifer recharge zones.

The action is known or expected not to be cost-effective, or to cause significant public controversy.

Categories of Generic Exclusions may be created if:

None of the conditions above are met, and

Adequate information exists to determine that the Generic Exclusion is appropriate for the type of response being considered.

For purposes of NEPA, no environmental review or public comment is required for a response option that is considered to be a Generic Exclusion. (Public comment will have already been accommodated at the time that Generic Exclusions were first defined for the removal program and published in the Federal Register.) Based on the definition of a Generic Exclusion, there are limited types of response activities which may qualify for an exclusion. There are three instances where use of a Generic Exclusion would be appropriate. In the first case, there is only one reasonable alternative for action, it has no measurable environmental impact, and it qualifies as a Generic Exclusion. An EE/CA is necessary to meet removal program requirements for non-time-critical removals, but an environmental review and public comment period are not necessary. In the second case, all the alternatives considered meet the qualifications of a Generic Exclusion. Preparing an EE/CA is necessary to meet program requirements for non-time-critical removals; however, for NEPA purposes, no environmental review or public comment period is required. The final case consists of several alternatives for action, some of which have no measurable environmental impact, and some of which do. In this instance, an EE/CA with an environmental review and public comment period is required to analyze those alternatives that do have an environmental impact. However, the generically excluded alternatives need not be further analyzed?

Examples of actions which may qualify as Generic Exclusions include:

Minor rehabilitation of existing treatment facilities or structures.

Replacement of equipment.

Temporary continuance of pumping, treatment, or disposal operations initiated by States or local governments and terminated for lack of State or local funding.

To use Generic Exclusions, a list of removal actions that qualify for Generic Exclusions based on the criteria described above will be developed and published in the Federal Register for public comment.

To implement a removal action that qualifies for a Generic Exclusion at a specific site, the public must be informed that an action has been granted a Generic Exclusion. When the action memo is signed, such notice must be

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in a newspaper of general circulation in the area. Removal program relations requirements must be met.

[Ed. note: a portion of this page is blacked out on source document, and therefore illegible.]

[illeg.]... STRATEGY

[illeg.] ... earlier, Classic Emergency and Time-Critical Removal Actions are [illeg.] ... from NEPA environmental review and public participation requirements [illeg.] ... statutory conflict. It should be noted, however, that an analysis [illeg.] ...natives is performed for all removal actions, although it need not [illeg.] ...ensive if time constraints preclude detailed analysis.

[illeg.] ... Time Critical Removal Actions, adequate time is generally available [illeg.] ...mal review and public comment period. To fulfill [illeg.] ...ntal review requirements for Non-Time-Critical Removal Actions, the [illeg.] ... is proposed:

> A list of types of removal actions that would be eligible for Generic Exclusions will be developed by EPA and published in the Federal Register for public comment. To implement these removal actions at specific sites, OSCs/RPMs would give appropriate public notice that the proposed action has been granted a Generic Exclusion. An EE/CA is necessary for decision documentation, but does not have to include an environmental review and public comment period.
>
> For all other Non-Time-Critical Removal Actions, OSCs/RPMs will be required to prepare an EE/CA which includes an environmental review and an opportunity for public comment.

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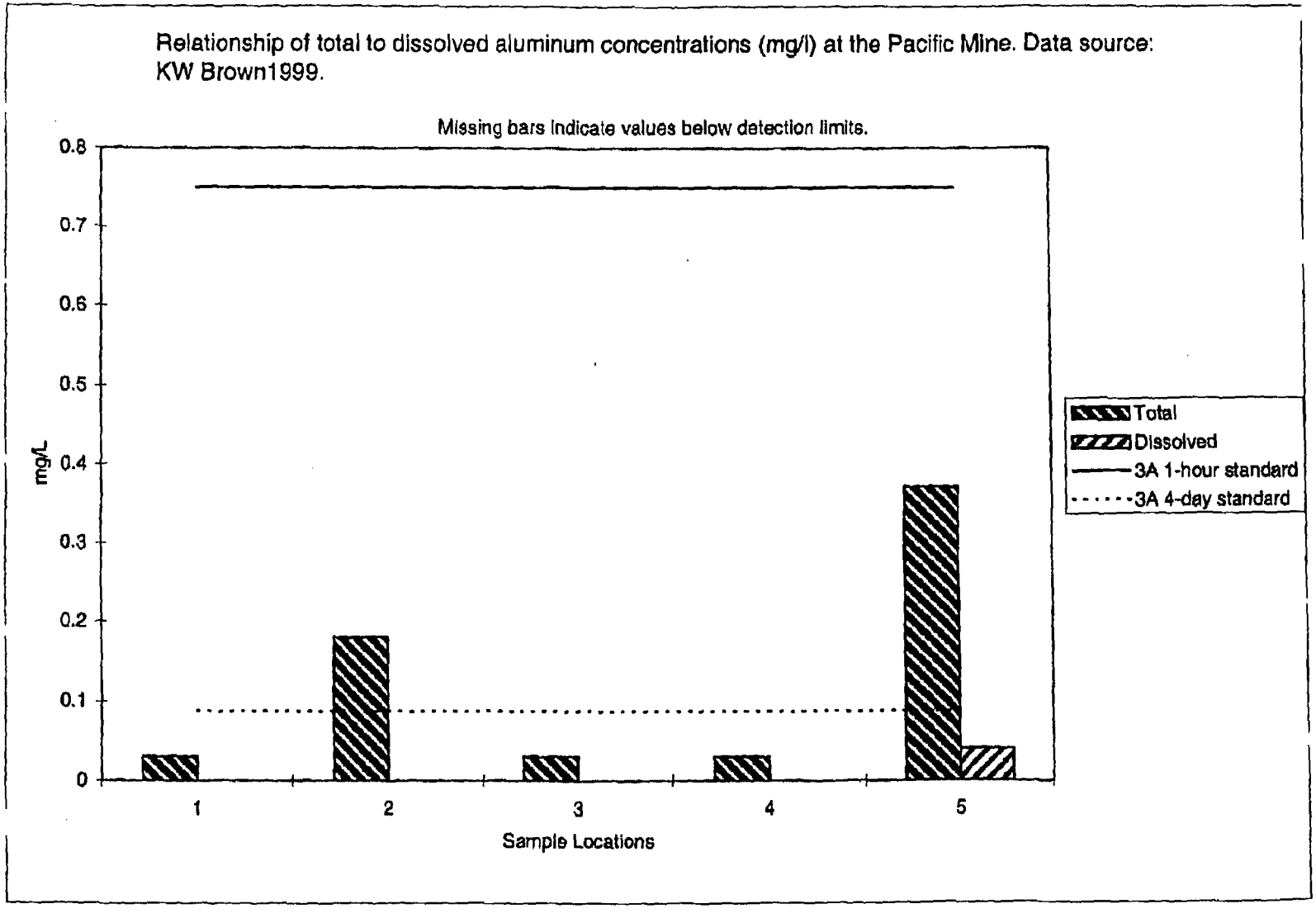
Relationship of total to dissolved aluminum concentrations (mg/l) at the Pacific Mine. Data source: KW Brown1999.



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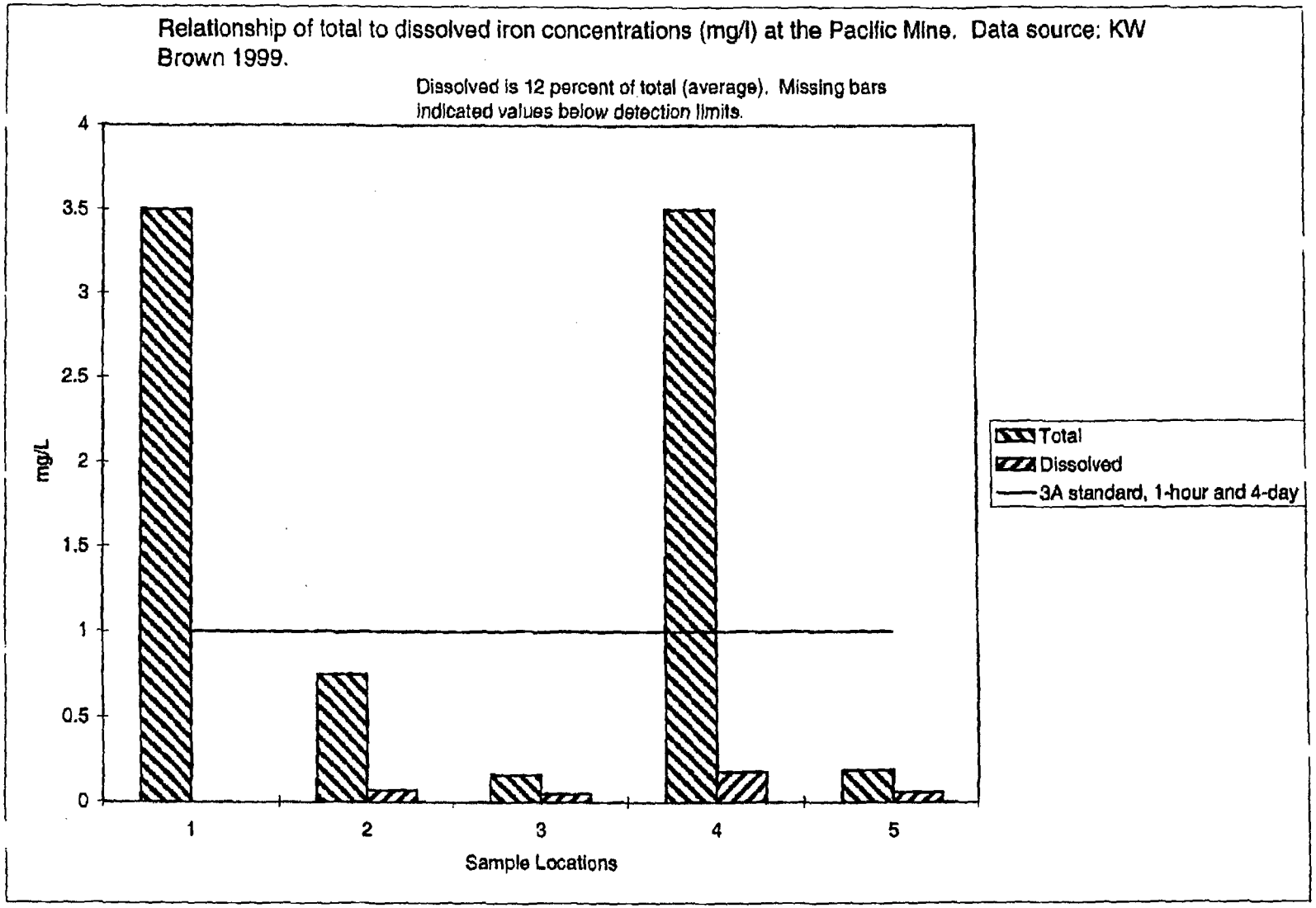
Relationship of total to dissolved iron concentrations (mg/l) at the Pacific Mine. Data source: KW Brown 1999.



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PRELIMINARY SURVEY OF WATER QUALITY IN MINE DRAINAGE IN SHEEPROCK MOUNTAINS AND NORTH FORK OF THE AMERICAN FORK RIVER

FOR

UINTA NATIONAL FOREST

BY

AVERE B. MERRITT, Ph.D., P.E.
Environmental Engineer

Provo, Utah
July 1988

Introduction

As part of an abandoned/inactive mine survey, several mines in the Sheeprock Mountains and in the American Fork River drainage were visited and water samples taken from mine drainage waters and nearby natural drainage streams on May 12 and May 18, 1988 respectively.

This survey was intended to help identify the locations and water quality parameters that would need more intensive sampling and evaluation later.

Quality Comparison Basis

Although heavy metal standards for quality for a cold water sports fishery would need to be somewhat more stringent than for drinking water, in this survey phase drinking water standards are used for comparison. Macroinvertebrate samples will then be used in selected areas to indicate the nature of the ecosystem stresses and then heavy metal conclusions drawn from those and additional water sampling results.

EPA Regulations

§ 141.11 Maximum contaminant levels for inorganic chemicals.

(a) The maximum contaminant level for nitrate is applicable to both community water systems and non-community water systems. The levels for the other inorganic chemicals apply only to community water systems. Compliance with maximum contaminant levels for inorganic chemicals is calculated pursuant to § 141.23.

(b) The following are the maximum contaminant levels for inorganic chemicals other than fluoride:

Contaminant	Level, milligrams per liter
Arsenic	0.05
Barium	1.
Cadmium	0.010
Chromium	0.05
Lead	0.05
Mercury	0.002
Nitrate (as N)	10.
Selenium	0.01
Silver	0.05

(c) When the annual average of the maximum daily air temperatures for the location in which the community water system is situated is the following, the maximum contaminant levels for fluoride are:

Temperature Degrees Fahrenheit	Degrees Celsius	Level, milligrams per liter
53.7 and below	12.0 and below	2.4
53.8 to 58.3	12.1 to 14.6	2.2
58.4 to 63.8	14.7 to 17.6	2.0
63.9 to 70.6	17.7 to 21.4	1.8
70.7 to 79.2	21.5 to 26.2	1.6
79.3 to 90.5	26.3 to 32.5	1.4

§ 141.12 Maximum contaminant levels for organic chemicals.

The following are the maximum contaminant levels for organic chemicals. They apply only to community water systems. Compliance with maximum contaminant levels for organic chemicals is calculated pursuant to § 141.24.

	Level, milligrams per liter
(a) Chlorinated hydrocarbons:	
Endrin (1,2,3,4,10, 10-hexachloro-6,7-epoxy-1,4, 4a,5,6,7,8,8a-octahydro-1,4-endo, endo-5,8 - dimethano naphthalene).	0.0002
Lindane (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer).	0.004
Methoxychlor (1,1,1-Trichloro-2, 2 - bis [p-methoxyphenyl] ethane).	0.1
Toxaphene ($C_{10}H_{10}Cl_8$-Technical chlorinated camphene, 67-69 percent chlorine).	0.005

Secondary Maximum Contaminant Levels for public water systems are:

Contaminant	SMCL
Chloride	250 mg/L
Color	15 color units
Copper	1 mg/L
Corrosivity	Noncorrosive
Foaming agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 (TON)
pH	6.5-8.5
Sulfate	250 mg/L
Total dissolved solids	500 mg/L
Zinc	5 mg/L

These levels represent reasonable goals for drinking water quality. The states may establish higher or lower levels which may be appropriate dependent upon local conditions such as unavailability of alternate source waters or other compelling factors, provided that public health and welfare are not adversely affected.

I. Sheeprock Mountains

A. HARKER MINE in the Harker Creek Drainage of the Sheeprock Mountains near Vernon, Utah.

East Portal (probably evaporatory shaft) was flowing about 0.1 cfs of clear water. The test results indicate the water to be of good quality with no heavy metal concentrations of concern, with only As (Arsenic) (2.5 ug/l) and Ba (Barium) (27 ug/l) above detection limits but both far below maximum allowed levels.

South Portal was flowing about 0.2 cfs of water, some signs of chemical instability in orangish precipitates and/or algae in pooled water at portal. Detectable levels of Cd (Cadmium), Pb (Lead), Ba (Barium), Fe (Iron), Mn (Manganese), and Zn (Zinc) were present. Lead at 585 ug/l and Zinc at 2700 ug/l are of some concern along with a pH of .

Conclusions These mine drainage waters are normally the main part if not the total flow of small Harker Creek this high in the drainage. During the late summer the stream is probably dry in spots down the stream below the mines. The aquatic habitat in these upper waters is naturally stressed (sediments, high temperatures, no flow) and not capable of supporting a balanced aquatic ecosystem including fish. When these mine drainage waters do flow into the lower reaches of the canyon drainage, mineral precipitation and dilution would make the relatively small amount of Pb and Zn of little concern.

Recommendation No action to be taken with the possible exception of piping the South Portal flow down past the spoils pile, a distance of perhaps 150 to 200 feet--a low-priority project in my opinion.

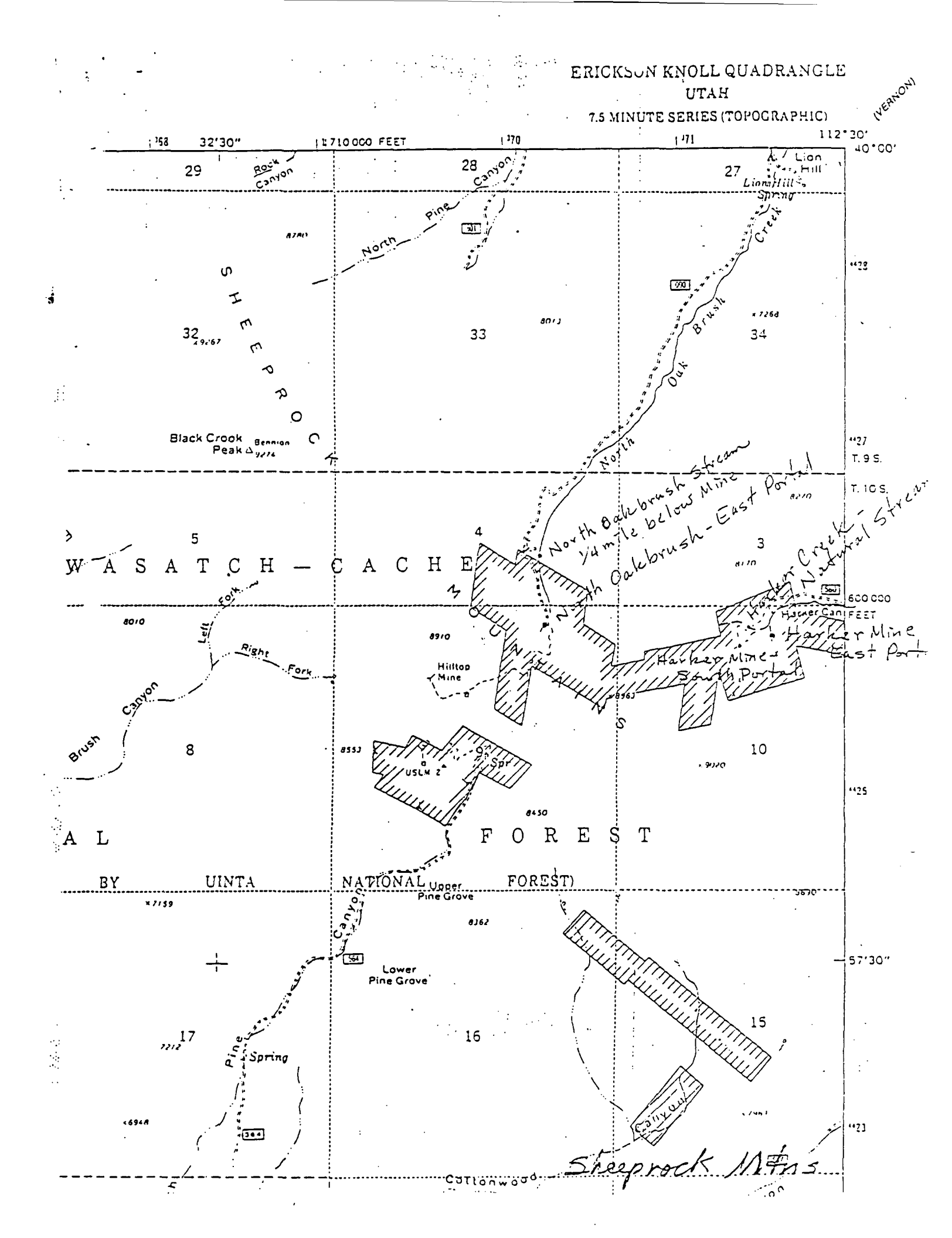
B. NORTH OAK BRUSH MINE in the North Oak Brush drainage of the Sheeprock Mountains near Vernon, Utah.

East Portal was the only portal observed to have portal drainage waters. The flow was approximately 0.1 cfs of clear water. As, Cd, Cu (Copper), Pb, Ba, Fe, Mn, and Zn were above detection limits but all rather low except Pb at 115 ug/l, Cd at 8 ug/l and Zn at 1200 ug/l which are still moderate.

The Creek was sampled about one-fourth mile below the mine. It was flowing about 0.3 cfs at this point. All detected metals in the mine drainage were at considerably lower levels at this point and none higher than drinking water standards.

Conclusions This mine drainage makes up a large part of the Creek flow this high in the drainage. The flow downstream is likely intermittent seasonally. The aquatic ecosystem is naturally stressed and not capable of supporting fish. The metals from the mine drainage are rather small quantities.

Recommendations - no action.


ERICKSON KNOLL QUADRANGLE
UTAH
7.5 MINUTE SERIES (TOPOGRAPHIC)
(VERNON)
112°30'
40°00'
32'30"
710 000 FEET
29
28
27
32
33
34
5
4
3
8
9
10
17
16
15
Rock Canyon
North Pine Canyon
Lion Hill
Lion Hill Spring
Oak Brush Creek
North Oakbrush Stream
1/4 mile below Mine
North Oakbrush - East Portal
SHEEPROCK
Black Crook Peak
Bennion
WASATCH — CACHE
NATIONAL FOREST
BY UINTA NATIONAL FOREST)
Left Fork
Right Fork
Brush Canyon
Hilltop Mine
Harker Mine
South Portal
Harker Mine
East Portal
Harker Creek
Natural Stream
USLM 2
Upper Pine Grove
Lower Pine Grove
Pine Canyon
Pine Spring
Cottonwood
Sheeprock Mts.
T. 9 S.
T. 10 S.
600 000 FEET
57'30"

II. North Fork of American Fork River above American Fork, Utah.

A. LOWER BCG MINE approximately 2 miles upstream of the Pacific Mine on east side of creek.

The portal drainage flow was about 0.1 cfs and the portal is covered by rubble. This is an Acid drainage of pH <4.5. Yellow precipitates are present. The flow percolates into the soil over some 200 feet and is not a surface flow into the creek (but is likely commingling with other percolating waters and seeping into the creek). Detectable levels of As, Cd, Ba, Fe, Mn and Zn are present but at fairly low levels with only Cd at 12 ug/l above DW standards.

Conclusions It was surprising that this acid drainage didn't contain higher levels of heavy metals. The fact that it percolates on into the stream undoubtedly mitigates its impact.

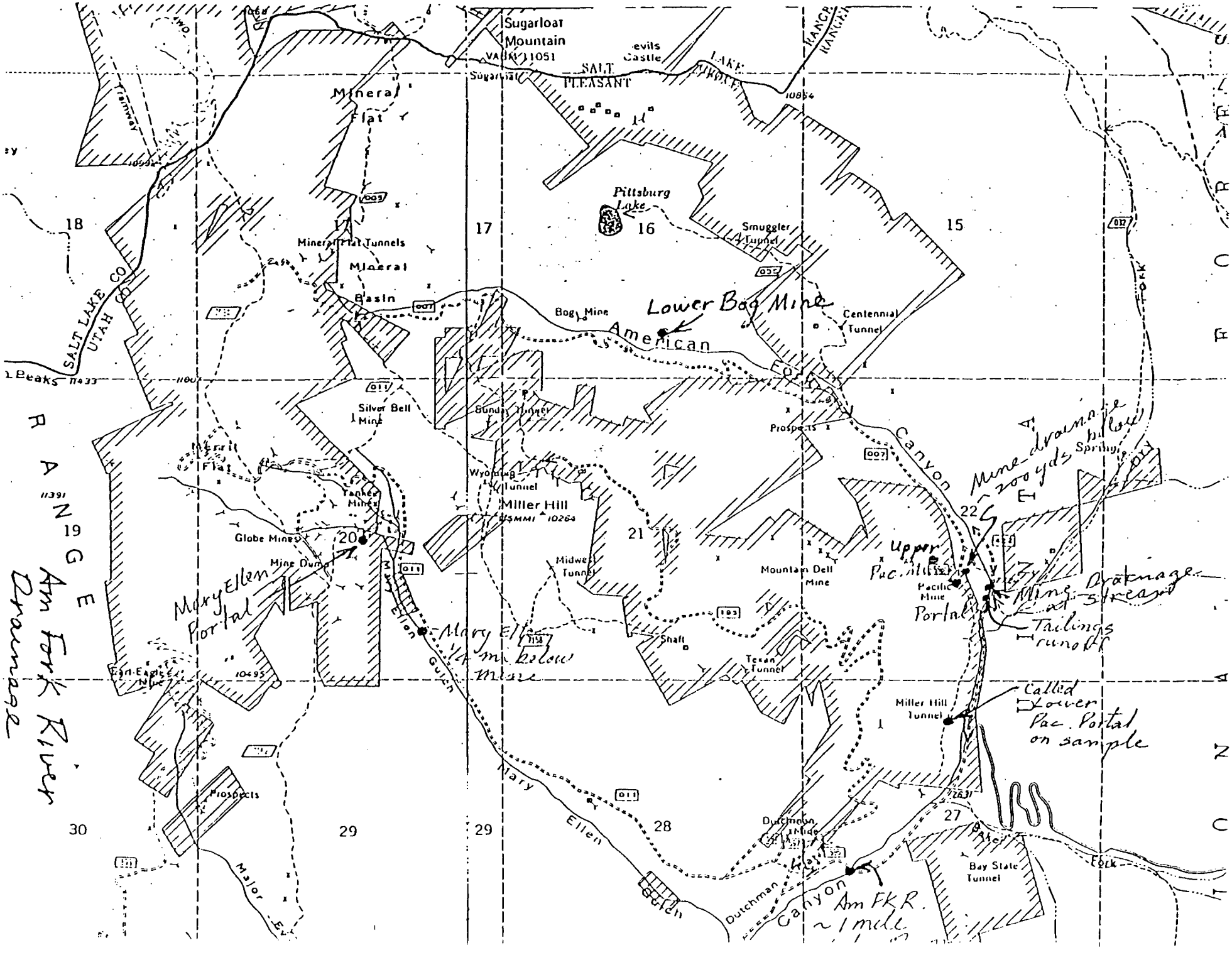
Recommendation - The relatively small percolating flow suggests no action on this mine drainage. However additional water quality samples and macroinvertebrate in the streamflow above and below the area during low stream in summer is desirable.

B. PACIFIC MINE

At Portal A drainage flow of about 0.2 cfs is not acidic. Detectable levels of most heavy metals were present but only As, Cu, and Pb are at significant levels at about one half of DW standards. As the flow continues on toward the stream, generally across spoil material, about 1/4 mile away it picks up metals and at the stream considerably higher levels are found with particular concern focusing on Pb at 4000 ug/l about 100 times DW standards of 50 ug/l. On the sampling day, a drizzling rain was causing a small runoff from the spoils/tailings; runoff flow of about 0.2 cfs was sampled at the bottom of the old spoils lagoon area near the stream. This sample gave by far the highest levels of heavy metals and As, Cd, & Pb were above DW standards with Pb by far the highest at 20,000 ug/l about 400 times the standard.

Upper Portal (NW Portal) A small mine drainage flow is piped from the portal and discharged a short distance downhill. The water is of high quality except Pb at 60 ug/l which is just above DW standards of 50 ug/l.

American Fork River A water sample from the stream (American Fork River) about 1 mile downstream contained some surface runoff and eroded sediment (light) on the day sampled. Quality was very good overall with only Pb at 60 ug/l of concern. This indicates that he upstream mine drainage was having some effect on the stream but the net result on the water quality was moderate to nie. Since considerable amounts of heavy metals are likely precipitating in the stream, macroinvertebrate samples are needed to assess the impact.


Sugarloaf Mountain
SALT PLEASANT
Mineral Flat
Pittsburg Lake
Smuggler Tunnel
Mineral Flat Tunnels
Mineral Basin
Bog Mine
Lower Bog Mine
American
Centennial Tunnel
SALT LAKE CO
UTAH CO
Silver Bell Mine
Sunday Tunnel
Prospects
Canyon
Mine drainage
Spring
Merrill Flat
Yankee Mines
Wyoming Tunnel
Miller Hill
Globe Mines
Mine Dump
Midway Tunnel
Mountain Dell Mine
Upper Pac. Portal
Pacific Mine
Portal
Mine Drainage
Tailings runoff
Mary Ellen Portal
Mary Ellen Gulch
Mary Ellen mine below
Shaft
Texan Tunnel
Miller Hill Tunnel
Called Lower Pac. Portal on sample
Prospects
Mary Ellen
Dutchman Mine
Dutchman Canyon
Am FK R. ~1 mile
Bay State Tunnel
Fork
Major
Drainage
Am Fork River
RANGE
18
17
16
15
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27

Conclusions. The mine drainage waters are not a serious concern at the portals although they do carry slightly high levels of some heavy metals. The real problem is the spoils/tailings. These need to be treated/stabilized and drainage waters routed around the tailings. I am in full agreement with Ben Albrechtsen in his July 1985 file report.

Recommendations. Additional water quality samples should be taken in the stream above and below the site. This should be complemented by macroinvertebrate samples and habitat surveys.

(Miller Tunnel)
Lower Pacific Mine just across the stream from the junction in the road (Baker Junction) and about 1/2 mile downstream from Pacific Mine. The drainage water of about 0.1 cfs is of very good quality and shows essentially no heavy metals.

Recommendations. No action except that local runoff from the spoils piles go directly into the stream and the stream is undercutting the toe of the pile. This does not affect the mine drainage water.

C. MARY ELLEN MINE AREA

Mary Ellen Mine drainage flow of about 0.3 cfs at portal contained detectable levels of As, Cd, Cu, Pb, Ba, Fe, Mn and Zn, but only As at 100 ug/l was above the 50 ug/l DW standard. The flow had a pH of 6.5 which is slightly acidic. The "yellow boy" precipitates in the flow is in concert with the low pH. Some other surface waters in the area give indication of low pH--yellow precipitates. The sample on Mary Ellen Creek about 1/4 mile below the mine had detectable levels of most of the same metals but none exceeded DW standards although Pb was 4 times higher at 40 ug/l, likely indicating the impact of surface drainage leaching from the spoils areas upstream.

Conclusions. Given the rather large areas of spoils/tailings the effect on the stream water quality was less than expected although the rain ceased about 2 hours earlier and surface wash had diminished compared to the Pacific Mine area samples.

Recommendations. Additional water quality and macroinvertebrate samples should be taken during summer lower flow conditions.

Recommended July 88 Sampling

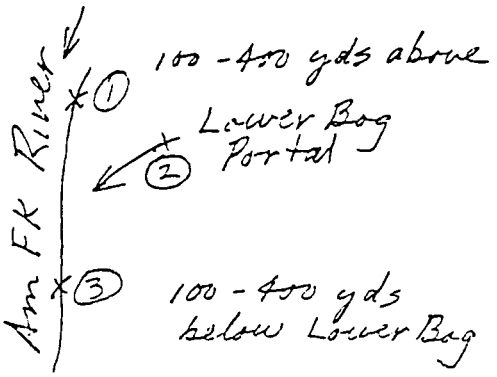
Site	Water Quality TDS, Alk, pH, As, Cd, Cu, Pb, Hg, Ag, Ba, Cr, Fe, Mn, Se, Zn	Other	Macro Invert
Lower Bog			
1	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	Hard SO_4	✓
2	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	Hard SO_4	
3	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	Hard SO_4	✓
Pacific			
1	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓		
2	✓ ✓ ✓ ✓ ✓		
3	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓		
4	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓		
5	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓		✓
6	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	Hard SO_4	✓
Mary Ellen			
1	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	Hard SO_4	✓
2	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	Hard SO_4	✓
3	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	Hard SO_4	✓
4	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	Hard SO_4	✓
5	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	Hard SO_4	✓

Late July, '88 sampling

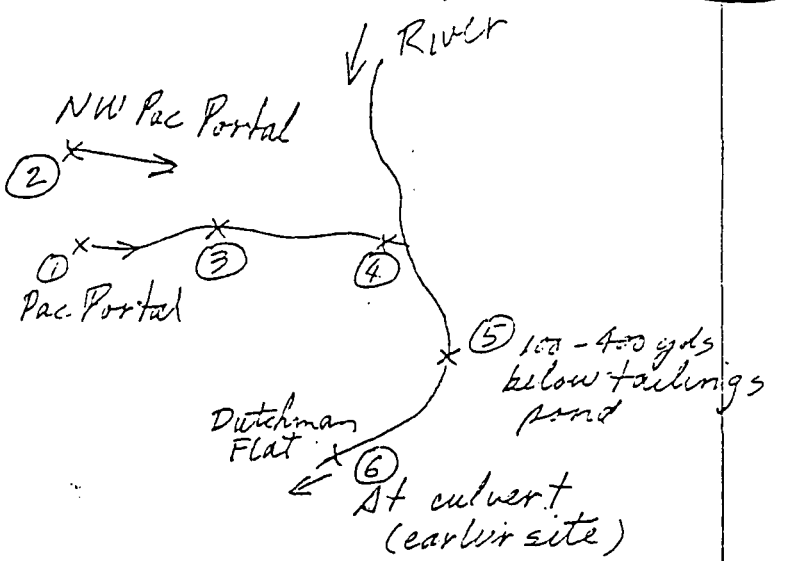
12 July 88 EBM

Schematic Site Map

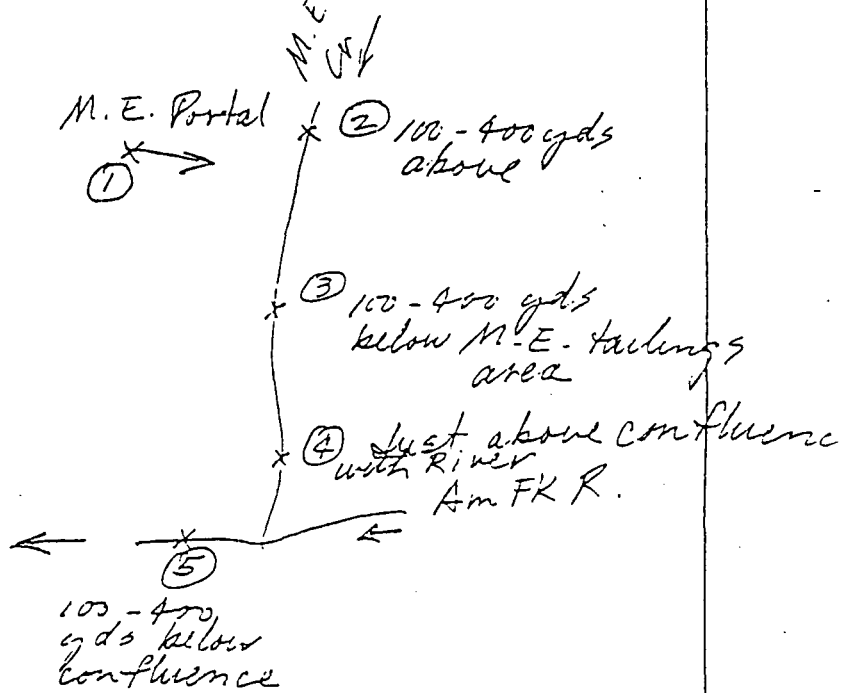
Lower Bog



Pacific



Mary Ellen



APPENDIX

Water Sample Testing Results

Description:	HARKER MINE SOUTH PORTAL		
Site ID:		Source: 00	
Cost Code:	3508		
Lab Number:	8802697	Type: 04	Date of Review and QA Validation
Sample Date:	88/05/12	Time: 10:30	Inorganic Review: 88/06/09
t. Cations:			Organic Review:
t. Anions:	17 me/l	Cations:	Radiochemistry Review:
rand Total:	17 me/l	Anions:	0.6 Microbiology Review:

Laboratory Analyses

Tot. Alk.	28 mg/l	TDS @ 180C	100 mg/l
T-Arsenic	<1.0 ug/l	T-Barium	0.028 mg/l
T-Cadmium	<16 ug/l	T-Chromium	<5.0 ug/l
T-Copper	<20.0 ug/l	T-Iron	0.76 mg/l
T-Lead	585.0 ug/l	T-Manganes	420.0 ug/l
Mercury	<0.2 ug/l	T-Selenium	<0.5 ug/l
T-Silver	<2.0 ug/l	T-Zinc	2700.0 ug/l

HARKER MINE EAST PORTAL
UINTA NAT.FOREST ATN.PAUL
P.O.BOX 829
PROVO UT 377-5780

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: HARKER MINE EAST PORTAL
Site ID: Source: 00
Cost Code: 3508
Lab Number: 8802698 Type: 04
Sample Date: 88/05/12 Time: 10:10
Tot. Cations:
Tot. Anions: 50 me/l Cations:
nd Total: 50 me/l Anions: 1.7

Date of Review and QA Validation
Inorganic Review: 88/06/09
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

Tot. Alk.	84 mg/l	TDS @ 180C	150 mg/l
T-Arsenic	2.5 ug/l	T-Barium	0.027 mg/l
T-Cadmium	<1 ug/l	T-Chromium	<5.0 ug/l
T-Copper	<20.0 ug/l	T-Iron	<0.02 mg/l
T-Lead	<5.0 ug/l	T-Manganes	<5.0 ug/l
Mercury	<0.2 ug/l	T-Selenium	<0.5 ug/l
T-Silver	<2.0 ug/l	T-Zinc	<20.0 ug/l

NORTH OAK BRUSH EAST PORTAL
UINTA NAT.FOREST ATN.PAUL
P.O.BOX 829
PROVO UT 377-5780

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: NORTH OAK BRUSH EAST PORTAL
Site ID: Source: 00
Cost Code: 3508
Lab Number: 8802696 Type: 04
Sample Date: 88/05/12 Time: 13:30
Tot. Cations:
Tot. Anions: 31 me/l Cations:
and Total: 31 me/l Anions:

Date of Review and QA Validation
Inorganic Review: 88/06/09
Organic Review:
Radiochemistry Review:
1.0 Microbiology Review:

Laboratory Analyses

Tot. Alk.	52 mg/l	TDS @ 180C	124 mg/l
T-Arsenic	8.5 ug/l	T-Barium	0.011 mg/l
T-Cadmium	4.8 ug/l	T-Chromium	<5.0 ug/l
T-Copper	41.0 ug/l	T-Iron	5.5 mg/l
T-Lead	115.0 ug/l	T-Manganes	83.0 ug/l
Mercury	<0.2 ug/l	T-Selenium	<0.5 ug/l
T-Silver	<2.0 ug/l	T-Zinc	1200.0 ug/l

HARKER NAT.CREEK PARALLEL TO SOUTH MINE
UINTA NAT.FOREST ATN.PAUL
P.O.BOX 829
PROVO UT 377-5780

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: HARKER NAT.CREEK PARALLEL TO SOUTH MINE
Site ID: Source: 00
Cost Code: 3508
Lab Number: 8802599 Type: 04
Sample Date: 88/05/12 Time:
Tot. Cations:
Tot. Anions: 28 me/l Cations:
and Total: 28 me/l Anions: 0.9

Date of Review and QA Validation
Inorganic Review: 88/06/09
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

Tot. Alk.	47 mg/l	TDS @ 180C	82 mg/l

PORTAL LOWER BOG MINE
UINTA NATIONAL FOREST
88 W 100 N
PROVO UT 84603 377-5780

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PORTAL LOWER BOG MINE
Site ID: Source: 00
Cost Code: 3508
Lab Number: 8802857 Type: 04
Sample Date: 88/05/18 Time: 12:30
Tot. Cations:
Tot. Anions: me/l Cations:
and Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

Tot. Alk.	0 mg/l	TDS @ 180C	90 mg/l
T-Arsenic	1.5 ug/l	T-Barium	0.037 mg/l
T-Cadmium	<2 ug/l	T-Chromium	<5.0 ug/l
T-Copper	<20.0 ug/l	T-Iron	7.9 mg/l
T-Lead	<5.0 ug/l	T-Manganes	270.0 ug/l
Mercury	<0.2 ug/l	T-Selenium	<0.5 ug/l
T-Silver	<2.0 ug/l	T-Zinc	510.0 ug/l

NORTH OAK BRUSH STREAM 1/4 MILE BL MINE
UINTA NAT.FOREST ATN.PAUL
P.O.BOX 829
PROVO UT 377-5780

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: NORTH OAK BRUSH STREAM 1/4 MILE BL MINE
Site ID: Source: 00
Cost Code: 3508
Lab Number: 8802695 Type: 04
Sample Date: 88/05/12 Time: 14:45
Tot. Cations:
Tot. Anions: 41 me/l Cations:
and Total: 41 me/l Anions:

Date of Review and QA Validation
Inorganic Review: 88/06/09
Organic Review:
Radiochemistry Review:
1.4 Microbiology Review:

Laboratory Analyses

Tot. Alk.	68 mg/l	TDS @ 180C	118 mg/l
T-Arsenic	<1.0 ug/l	T-Barium	0.017 mg/l
T-Cadmium	1 ug/l	T-Chromium	<5.0 ug/l
T-Copper	<20.0 ug/l	T-Iron	1.2 mg/l
T-Lead	40.0 ug/l	T-Manganes	160.0 ug/l
Mercury	<0.2 ug/l	T-Selenium	<0.5 ug/l
T-Silver	<2.0 ug/l	T-Zinc	80.0 ug/l

PACIFIC MINE PORTAL FLOW 200 YDS. BELOW PORTA
UINTA NATIONAL FOREST
88 W 100 N
PROVO UT 84603 377-5780

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PACIFIC MINE PORTAL FLOW 200 YDS. BELOW PORTA
Site ID: Source: CO
Cost Code: 3508
Lab Number: 8802862 Type: 04
Sample Date: 88/05/18 Time:
Tot. Cations:
Tot. Anions: 91 me/l Cations:
and Total: 91 me/l Anions: 3.0

Date of Review and QA Validation
Inorganic Review: 88/06/22
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

Tot. Alk.	152 mg/l	TDS @ 180C	202 mg/l
T-Arsenic	24.0 ug/l	T-Barium	0.11 mg/l
T-Cadmium	9 ug/l	T-Chromium	<5.0 ug/l
T-Copper	62.0 ug/l	T-Iron	6.6 mg/l
T-Lead	180.0 ug/l	T-Manganes	23.0 ug/l
Mercury	<0.2 ug/l	T-Selenium	<0.5 ug/l
T-Silver	<2.0 ug/l	T-Zinc	1300.0 ug/l

PACIFIC MINE MAIN PORTAL AT ~~ADIT~~ OUTLET
UINTA NATIONAL FOREST
88 W 100 N
PROVO UT 84603 377-5780

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PACIFIC MINE MAIN PORTAL AT ~~ADIT~~ OUTLET
Site ID: Source: 00
Cost Code: 3508
Lab Number: 8802854 Type: 04
Sample Date: 88/05/18 Time: 10:00
Tot. Cations:
T. Anions: me/l Cations:
Ind Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

Tot. Alk.	163 mg/l	TDS @ 180C	202 mg/l
T-Arsenic	22.0 ug/l	T-Barium	0.069 mg/l
T-Cadmium	26 ug/l	T-Chromium	<5.0 ug/l
T-Copper	134.0 ug/l	T-Iron	4.0 mg/l
T-Lead	25.0 ug/l	T-Manganes	11.0 ug/l
Mercury	0.2 ug/l	T-Selenium	<0.5 ug/l
T-Silver	<2.0 ug/l	T-Zinc	800.0 ug/l

PAC.MINE NW PORTAL PIPED OUT OF MINE
UINTA NATIONAL FOREST
88 W 100 N
PROVO UT 84603 377-5780

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PAC.MINE NW PORTAL PIPED OUT OF MINE
Site ID: Source: 00
Cost Code: 3508
Lab Number: 8802856 Type: 04
Sample Date: 88/05/18 Time: 10:10
Tot. Cations:
t. Anions: me/l Cations:
and Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

Tot. Alk.	198 mg/l	TDS @ 180C	208 mg/l
T-Arsenic	1.0 ug/l	T-Barium	0.15 mg/l
T-Cadmium	<1 ug/l	T-Chromium	<5.0 ug/l
T-Copper	<20.0 ug/l	T-Iron	0.091 mg/l
T-Lead	160.0 ug/l	T-Manganes	19.0 ug/l
Mercury	<0.2 ug/l	T-Selenium	<0.5 ug/l
T-Silver	<2.0 ug/l	T-Zinc	78.0 ug/l

PACIFIC PORTAL AT CREEK (MARKINGS WIPED OFF
UINTA NATIONAL FOREST
88 W 100 N
PROVO UT 84603 377-5780

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PACIFIC PORTAL AT CREEK (MARKINGS WIPED OFF
Site ID: Source: 00
Cost Code: 3508
Lab Number: 8802859 Type: 04
Sample Date: 5/18/88 Time:
Tot. Cations:
t. Anions: me/l Cations:
and Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

Tot. Alk.	164 mg/l	TDS @ 180C	200 mg/l
T-Arsenic	22.5 ug/l	T-Barium	0.28 mg/l
T-Cadmium	33.1 ug/l	T-Chromium	<5.0 ug/l
T-Copper	60.0 ug/l	T-Iron	5.3 mg/l
T-Lead	4000.0 ug/l	T-Manganes	23.0 ug/l
Mercury	0.63 ug/l	T-Selenium	<0.5 ug/l
T-Silver	15.0 ug/l	T-Zinc	1600.0 ug/l

LOWER PAC.MINE PORTAL ACROSS STREAM FROM BAKE
UINTA NATIONAL FOREST
88 W 100 N
PROVO UT 84603 377-5780

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Miller Hill Portal

Description: LOWER PAC.MINE PORTAL ACROSS STREAM FROM BAKE
Site ID: Source: 00
Cost Code: 3508
Lab Number: 8802863 Type: 04
Sample Date: 88/05/18 Time: 10:45
Tot. Cations:
Anions: 109 me/l Cations:
d Total: 109 me/l Anions: 3.6

Date of Review and QA Validation
Inorganic Review: 88/06/22
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

Tot. Alk.	183 mg/l	TDS @ 180C	204 mg/l
T-Arsenic	<1.0 ug/l	T-Barium	0.036 mg/l
T-Cadmium	<1 ug/l	T-Chromium	<5.0 ug/l
T-Copper	<20.0 ug/l	T-Iron	0.048 mg/l
T-Lead	<5.0 ug/l	T-Manganes	6.0 ug/l
Mercury	<0.2 ug/l	T-Selenium	<0.5 ug/l
T-Silver	<2.0 ug/l	T-Zinc	<20.0 ug/l

PACIFIC N TAILING
UINTA NATIONAL FOREST
88 W 100 N
PROVO UT 84603 377-5780

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PACIFIC N TAILING
Site ID: Source: 00
Cost Code: 3503
Lab Number: 8802860 Type: 04
Sample Date: 88/05/18 Time:
Tot. Cations:
. Anions: me/l Cations:
d Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

Tot. Alk.	21 mg/l	TDS @ 180C	140 mg/l
T-Arsenic	90.0 ug/l	T-Barium	0.15 mg/l
T-Cadmium	4.51 ug/l	T-Chromium	<5.0 ug/l
T-Copper	260.0 ug/l	T-Iron	13.0 mg/l
T-Lead	20000.0 ug/l	T-Manganes	48.0 ug/l
Mercury	3.24 ug/l	T-Selenium	1.0 ug/l
T-Silver	45.0 ug/l	T-Zinc	77700.0 ug/l

MARY ELLEN PORTAL
UINTA NATIONAL FOREST
88 W 100 N
PROVO UT 84603 377-5780

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: MARY ELLEN PORTAL
Site ID: Source: 00
Cost Code: 3508
Lab Number: 8802858 Type: 04
Sample Date: 88/05/18 Time: 15:00
Tot. Cations:
Tot. Anions: me/l Cations:
d Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

Tot. Alk.	36 mg/l	TDS @ 180C	206 mg/l
T-Arsenic	100.0 ug/l	T-Barium	0.019 mg/l
T-Cadmium	1.4 ug/l	T-Chromium	<5.0 ug/l
T-Copper	40.0 ug/l	T-Iron	9.9 mg/l
T-Lead	10.0 ug/l	T-Manganes	140.0 ug/l
Mercury	<0.2 ug/l	T-Selenium	<0.5 ug/l
T-Silver	<2.0 ug/l	T-Zinc	1200.0 ug/l

NORTH FORK AMERICAN RIVER AT DUTCHMAN FLAT
UINTA NATIONAL FOREST
88 W 100 N
PROVO UT 84603 377-5780

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: NORTH FORK AMERICAN RIVER AT DUTCHMAN FLAT
Site ID: Source: 00
Cost Code: 3508
Lab Number: 8802855 Type: 04
Sample Date: 88/05/18 Time: 16:10
Tot. Cations:
. Anions: me/l Cations:
nd Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

Tot. Alk.	83 mg/l	TDS @ 180C	102 mg/l
T-Arsenic	2.5 ug/l	T-Barium	0.056 mg/l
T-Cadmium	<1 ug/l	T-Chromium	<5.0 ug/l
T-Copper	<20.0 ug/l	T-Iron	0.45 mg/l
T-Lead	60.0 ug/l !	T-Manganes	31.0 ug/l
Mercury	<0.2 ug/l	T-Selenium	<0.5 ug/l
T-Silver	<2.0 ug/l	T-Zinc	77.0 ug/l

MARY ELLEN CREEK 1/4 MILE BELOW MINE AREA
UINTA NATIONAL FOREST
88 W 100 N
PROVO UT 84603 377-5780

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: MARY ELLEN CREEK 1/4 MILE BELOW MINE AREA
Site ID: Source: 00
Cost Code: 3508
Lab Number: 8802861 Type: 04
Sample Date: 88/05/18 Time:
Tot. Cations:
Tot. Anions: 55 me/l Cations:
d Total: 55 me/l Anions: 1.8

Date of Review and QA Validation
Inorganic Review: 88/06/22
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

Tot. Alk.	92 mg/l	TDS @ 180C	132 mg/l
T-Arsenic	<1.0 ug/l	T-Barium	0.039 mg/l
T-Cadmium	2 ug/l	T-Chromium	<5.0 ug/l
T-Copper	42.0 ug/l	T-Iron	1.1 mg/l
T-Lead	40.0 ug/l	T-Manganes	46.0 ug/l
Mercury	<0.2 ug/l	T-Selenium	<0.5 ug/l
T-Silver	<2.0 ug/l	T-Zinc	310.0 ug/l

TABBED PAGE
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AMERICAN FORK HYDROLOGY AND WATER QUALITY STUDY

PREPARED FOR:

Utah Division of Oil, Gas and Mining
Abandoned Mine Reclamation Program
355 W. North Temple
Triad Center, Suite 350
Salt Lake City, UT 84180-1203

and

United States Forest Service
Uinta National Forest
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Provo, UT 84601

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February 3, 1993

AMERICAN FORK HYDROLOGY
AND
WATER QUALITY STUDY

Lidstone & Anderson, Inc.
Water Resources and Environmental Consultants

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1.0 INTRODUCTION

A water quality investigation was conducted at several abandoned mine sites in the American Fork Canyon, Utah County, Utah during the three day period of July 7th through the 9th, 1992. The project was cooperatively funded by the Utah Division Oil, Gas and Mining (DOGM), Abandoned Mine Reclamation Program (AMR) and the U.S. Forest Service, Uinta National Forest. Several previous studies had been conducted in the area including:

(1) Merritt, Lavere B., 1988; "Preliminary Survey of Water Quality in Mine Drainage in Sheeprock Mountains and North Fork of the American Fork River." (Water Quality).

(2) Mangum, Fred, 1988; "Aquatic Ecosystem Inventory, Macroinvertebrate Analysis; Annual Progress Report, Uinta National Forest". (Water Quality and Macroinvertebrates).

(3) Kastning-Culp, Nancy, et.al., 1992; "Year End Report On Mitigation Systems for Hard Rock Mine Effluent in Utah". (Soils, Water Quality, Vegetation, Ecosystems).

1.1 Site Conditions

The American Fork Canyon Mining District is characterized by inactive underground mine workings, shafts, portals, spoils and tailings located in the Uinta National Forest. The majority of these workings are associated with valid mining claims. A number of abandoned mine sites have been inventoried by the Utah DOGM in the past. The scope of the current sampling study was to specifically investigate three mine drainage problem areas: the Pacific Mine, the Lower Bog Mine and the Mary Ellen Gulch Mines (Figure 1).

In many cases the underground workings of inactive mines are flooded by ground water. This ground water comes in contact with the mineralized rock, spent ore and/or tailings, which results in changes in water chemistry. Typically this change manifests itself as lower pH conditions and higher concentrations of trace metals. Where there is sufficient ground water "head" or gradient, the mine water is discharged to the surface and enters area streams. If toxic levels of trace metals are present in these mine waters, an adverse impact to area streams or aquatic life can occur.

1.2 Site Investigation

The purpose of this study is to investigate the hydrology, geochemistry and water quality impacts of mine drainage on receiving waters within the National Forest Lands. Following the analysis of the water quality impacts, a conceptual "action plan" will be developed. This report documents the sampling study, the laboratory analyses, and a mass balance analysis of the water quality in the vicinity of the three study sites.

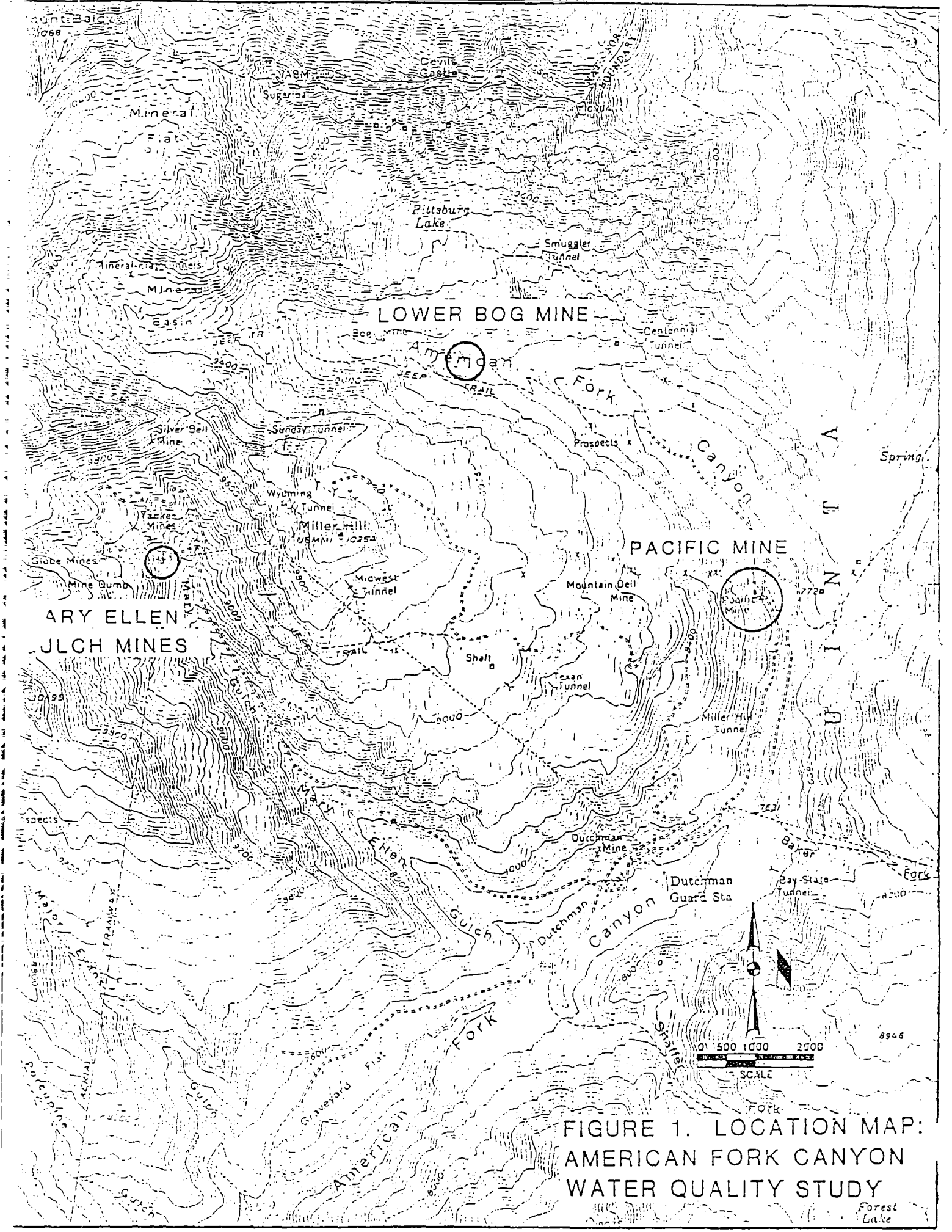


FIGURE 1. LOCATION MAP: AMERICAN FORK CANYON WATER QUALITY STUDY

Field investigations were conducted by Lidstone & Anderson, Inc. and a representative of the Utah Division of Oil, Gas & Mining, AMR Program to determine existing conditions. These investigations included water sample collection, flow estimates, measurements of field water quality and soil pH parameters. Additional analyses included observations of geological and mineralogical conditions, natural biological and geochemical controls or hydrochemical barrier conditions present at each site.

Flow estimates were made at each portal and in the vicinity of sample points using a bucket and stop watch. Flow estimates were made along major drainages (Mary Ellen Gulch and the North Fork of the American Fork) using a Pygmy Current Meter. Field water quality parameters included field pH (Orion Research Model No. 200), field conductivity and temperature (YSI Model No. 33) and color. Water samples were collected and handled using standard EPA sampling protocol. Samples were unfiltered, preserved in the field, packed in ice and delivered to the Utah Department of Health laboratory within 24 hours of collection. Laboratory analysis included major anions and cations, total dissolved solids, total alkalinity and selected acid soluble trace metals.

Figure 2 presents the sample sites in relationship to the mine portals and receiving streams. Field pH and laboratory TDS characterize the water quality at each sampling point. Flow discharge measurement points and estimates are presented on this figure. Table 1 documents the field sampling program, a description of each sample site and the field parameters measured at each site. The analytical results and a conceptual sketch of each site showing the relative locations of sample sites are presented in Appendix A. Gaging measurement data sheets are presented in Appendix B.

2.0 PHYSIOGRAPHIC AND GEOLOGIC SETTING

The American Fork Canyon study area is situated within the upper headwaters of the North Fork of the American Fork River in Utah County, Utah. The locations of the American Fork River and its various tributaries are shown on Figure 1. The North Fork is a south west-flowing drainage tributary to the American Fork River, which drains into Utah Lake, the Jordan River and eventually into the Great Salt Lake. The headwaters of the American Fork Canyon in the vicinity of the project area range in elevation from 9,200 to over 10,000 feet above sea level. The drainage originates in a glaciated cirque basin, known as Mineral Basin at the base of Mount Baldy. Mary Ellen Gulch is a southeast draining tributary to the North Fork of the American Fork, entering the American Fork Canyon at Dutchman's Flat. The project area within Mary Ellen Gulch ranges in elevation from 8,800 to 9,400 feet above sea level. This drainage originates in a glaciated cirque basin, known as Merril Flat at the base of Twin Peaks.

The streams draining the divide are steep gradient cobble- to boulder-bed streams. The flow conditions of the streams range from rapid to turbulent along most of the project area reaches. The drainage pattern is dendritic with most tributaries sustaining a base flow throughout most of the year.

The geologic setting of the project area is extensively fractured and mineralized carbonate and metasedimentary rocks of Paleozoic or Precambrian Age. The oldest rocks within the

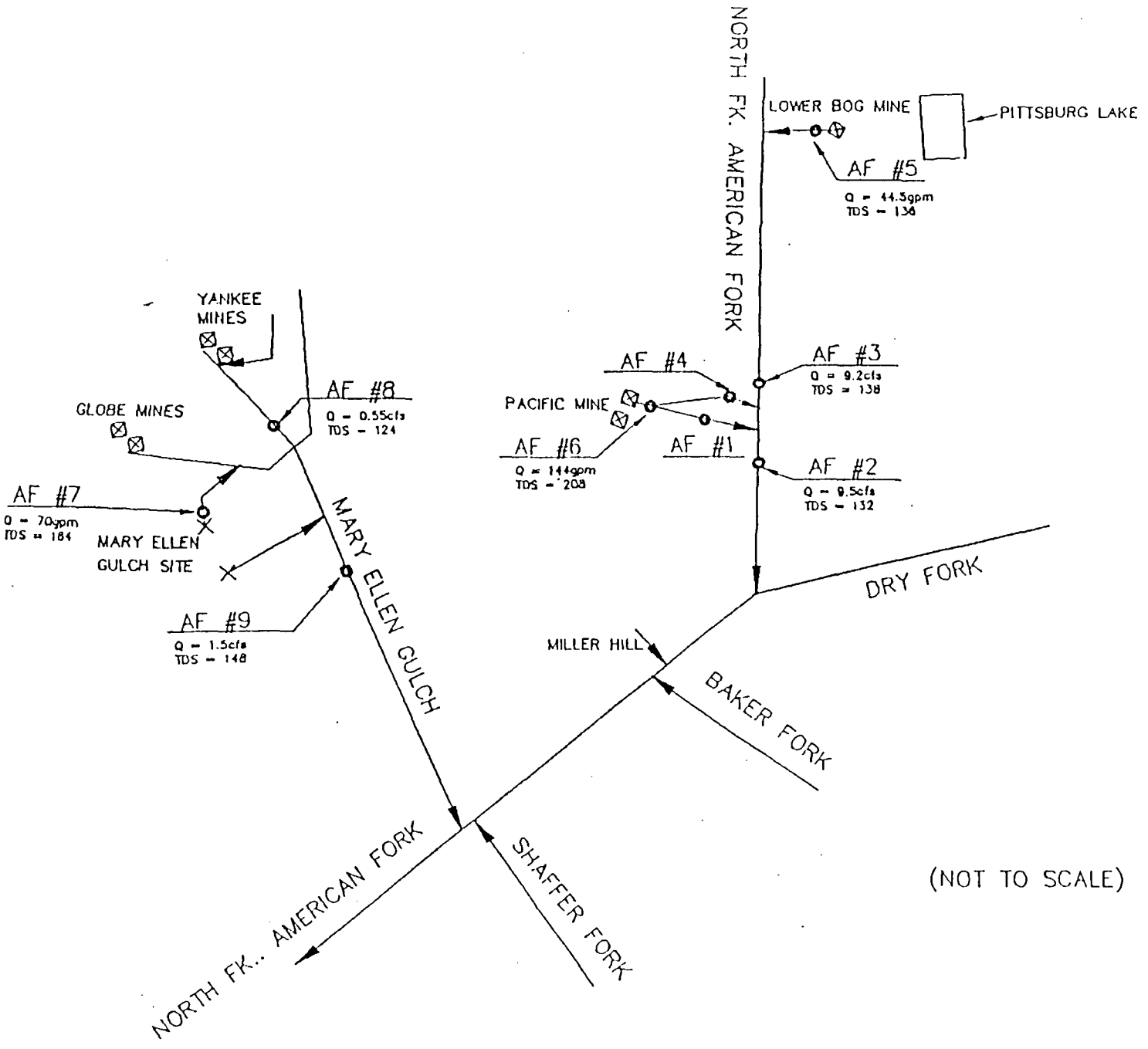


FIGURE 2. AMERICAN FORK CANYON SAMPLING SITES SCHEMATIC

Table 1. American Fork Canyon Water Sampling Program.

Sample No.	Data Collected	Time	Discharge	Field Parameters				Location
				pH (s.u)	TDS (ppm)	EC (umhos)	Temp. (°C)	
AF#1	7/8/92	12:56 PM	6.5 gpm[a]	7.8	—	325	18.3	Discharge from Pacific Mine ab. confluence w/American Fork, through tailings
AF#2	7/8/92	1:20 PM	9.5 cfs[b]	8.0	130	170	13.3	American Fork bl. Pacific Mine
AF#3	7/8/92	12:20 PM	9.2 cfs	8.4	140	150	11.3	American Fork ab. Pacific Mine
AF#4	7/8/92	12:25 PM	12 gpm	8.0	–	280	11.7	Discharge from Pacific Mine after treatment in Beaver Pond ab. confluence
AF#5	7/8/92	2:25 PM	44.5 gpm	5.1	80	–	10.1	Discharge form Lower Bog Mine Portal
AF#6	7/8/92	3:30 PM	144 gpm	6.5	180	230	7.8	Discharge from Pacific Mine Portal
AF#7	7/8/92	5:05 PM	70 gpm	5.9	140	180	8.0	Discharge from North Portal Mary Ellen Gulch
AF#8	7/8/92	5:50 PM	0.55 cfs	8.1	–	140	9.1	Mary Ellen Gulch us. of AMR and active mine disturbance
AF#9	7/8/92	7:15 PM	1.50 cfs	7.9	–	170	10.4	Mary Ellen Gulch ds. of AMR and active mine disturbance
Miscellaneous Sampling Sites								
–	7/7/92	–	2.5 gpm[a]	7.2	–	205	7.0	Mary Ellen Gulch South Portal
–	7/7/92	–	0.6 cfs[c]	7.7	–	105	10.2	Trib. North of North Portal Mary Ellen Gulch Mine us. of AMR disturbance
–	7/6/92	–	0.0[c]	6.9	260	–	22.2	Ponded water on tailings at Pacific Mine
–	7/8/92	2:45 PM	5-9 cfs[c]	7.9	110	–	10.0	N. Fork American Fork ab. Lower Bog Mine discharge.
–	7/8/92	2:55 PM	5-9 cfs[c]	7.5	100	–	11.2	N. Fork American Fork bl. Lower Bog Mine discharge

a gpm measured utilizing a stopwatch and bucket
b cfs measured utilizing a pygmy meter
c flow visually estimated

immediate project area compromise the Late Precambrian Big Cottonwood Formation, which consists of quartzites, shales and metasedimentary rocks. The formation is approximately 16,000 feet thick (James, L. P., 1979) and is well exposed on steeply dipping exposures along the American Fork Canyon and Mary Ellen Gulch. It is exposed along the American Fork channel immediately below the Lower Bog Mine, as well as along the steeper reaches of Mary Ellen Gulch. The Paleozoic sequence within the project area consists of the Cambrian Age Tintic Quartzite, Ophir Formation and Maxfield Limestone, and the Mississippian Age Fitchville Formation, Deseret and Gardison Limestones. The Pacific Mine portals lie within a fault graben block of Gardison Limestone. The Mary Ellen Gulch mine portals are situated in Cambrian Age Maxfield Limestone and dolomites of the Mississippian Fitchville Formation. The Lower Bog Mine portal was "driven into" the Precambrian Big Cottonwood Formation.

2.1 Geochemical Setting of the Project Area

Mineralization and ore trends within the project area are closely associated with the Miocene age emplacement of silicic, intermediate and aplite dikes of the Alta Stock (James, L.P. 1979). The rocks of the Alta Stock are typically granodiorite to quartz monzonite in composition. Mineralization and alteration trends are concordant with the extensive faulting and fracturing of the host rocks. Historical mining in the area generally followed these ore trends. The chemistry of the Alta Stock and the mineralization within the American Fork Canyon is high in copper, lead, zinc and iron. The high arsenic and cadmium concentrations present in the mineralized zones are associated with accessory minerals, which occur as the sulfides, arsenates and carbonate minerals.

The characteristics of the mine drainage chemistry are a reflection of the relationship of host rock chemistry, the surrounding equilibrium conditions of waters in contact with the mineralized or "mined zone" and upgradient ground water quality. The "mined" or mineralized zone is high in both primary sulfides, secondary sulfates and hydrous sulfates. Because of the high sulfide content of the mineralized rock, one would typically anticipate acid mine drainage from the American Fork portals. Of the three sites investigated, two sites are characterized by nearly neutral pH conditions: the Pacific Mine and the Mary Ellen Gulch Mines. In both cases the host rocks are limestones or dolomites and are rich in carbonates. Although the oxidation of the sulfides within the mineralized zones continues to occur and generate acid pH conditions, the buffering capacity of the upgradient ground water quality is such that the water is neutralized upon exiting the mine portal. Acid drainage is present at the Lower Bog Mine (pH ranges from 3.9 to 5.1). The host rock at the Lower Bog Mine is predominantly quartzites, siltstones and shales of the Big Cottonwood Formation. The host rock and the upgradient water quality does not have the capacity to buffer the acid mine drainage conditions at this site.

3.0 SAMPLING RESULTS

3.1 Lower Bog Mine

The Lower Bog Mine portal is located at an approximate elevation of 8,520 feet AMSL and consists of a single bedrock opening, tailings dump and miscellaneous spoil piles. Discharge

from the portal was gaged at approximately 44.5 gpm on July 8, 1992. The water was clear with "yellow boy" or hydrous iron oxide precipitate in the vicinity of the discharge. On that day, field pH was measured at 5.1 and the field analysis of total dissolved solids was 80 ppm. Based on the considerable amount of iron precipitate at the mouth of the portal discharge, these results were somewhat surprising. A single water sample was collected at the site. The laboratory results (Figure 3) suggest that the discharging waters were not in equilibrium at the time of sampling. A laboratory pH value of 3.9 suggested a greater change in pH (from field to lab) than would be anticipated. The laboratory cation-anion balance was 21%. Typically acceptable laboratory balance is less than 5%. The 1992 sample results are similar to the 1988 (Merritt, 1988) sampling effort eliminating laboratory error as the sole problem.

To evaluate the impact of the Lower Bog portal discharge on the North Fork of the American Fork, field parameters were measured at various points within the hydrologic system. The portal discharge enters the main stream at two points (Figure 3): (1) as surface flow adjacent to a tailings dump and, (2) as seepage through the tailings dump. At the surface flow location, the pH had increased from the upstream value of 5.1 to 6.4. At the seepage location the pH had increased from 5.1 to 7.0, suggesting the neutralization of waters in transit from the mouth of the portal to its confluence with the main stream. On the date of sampling (7/8/92), measurements of field parameters upstream and downstream of the point of confluence were made to determine if there was any impact to the waters of the American Fork. Upstream of the portal discharge, a pH of 7.95 and total dissolved solids content (TDS) of 110 ppm were measured. Downstream of the portal discharge a pH of 7.52 and a TDS of 100 ppm were measured, suggesting that dilution is the principal mechanism for the mitigation of adverse impacts. Discharge of the receiving waters on July 8, 1992 was estimated at 3.31 cfs (from basin area reduction of measured channel discharges along the North Fork and Mary Ellen Gulch). The portal discharge was measured at 44.5 gpm or 0.1 cfs reflecting a dilution of 33:1.

The 1992 water quality analysis of the Lower Bog Mine portal indicate that excessive concentrations of trace metals (iron, cadmium, zinc, copper and lead) are associated with the portal discharge. Similar studies at the adjacent mine (Pacific and Mary Ellen Gulch) indicate that copper and iron concentrations are not problematical since these parameters are strictly pH and Eh dependent. Cadmium, zinc and lead behave in a slightly different geochemical manner. Sampling completed by Mangum, 1988 indicated that upstream concentrations of zinc averaged approximately 20 ug/l during a July and September sampling period. Downstream of the Lower Bog discharge, zinc concentration increased to 77 (in July) to 190 ug/l in September. Sampling of macroinvertebrates at two stations (Mangum, 1988) indicated that the effects of the portal discharge resulted in "stress conditions along the lower reach".

3.2 Pacific Mine

The Pacific Mine is located at an elevation of 7800 feet AMSL and consists of two discharging portals, a tailings dump, miscellaneous mine-related structures and spoil piles. An upper or northwest portal was not investigated as part of this study. Previous studies (Merritt, 1988) had indicated that additional dissolution of trace metals occurred where the discharge from the south portal commingled with an abandoned tailings dump. Kastning-Culp, et. al., 1992 investigated the biological uptake of trace metals by an adjacent wetlands/beaver pond north of

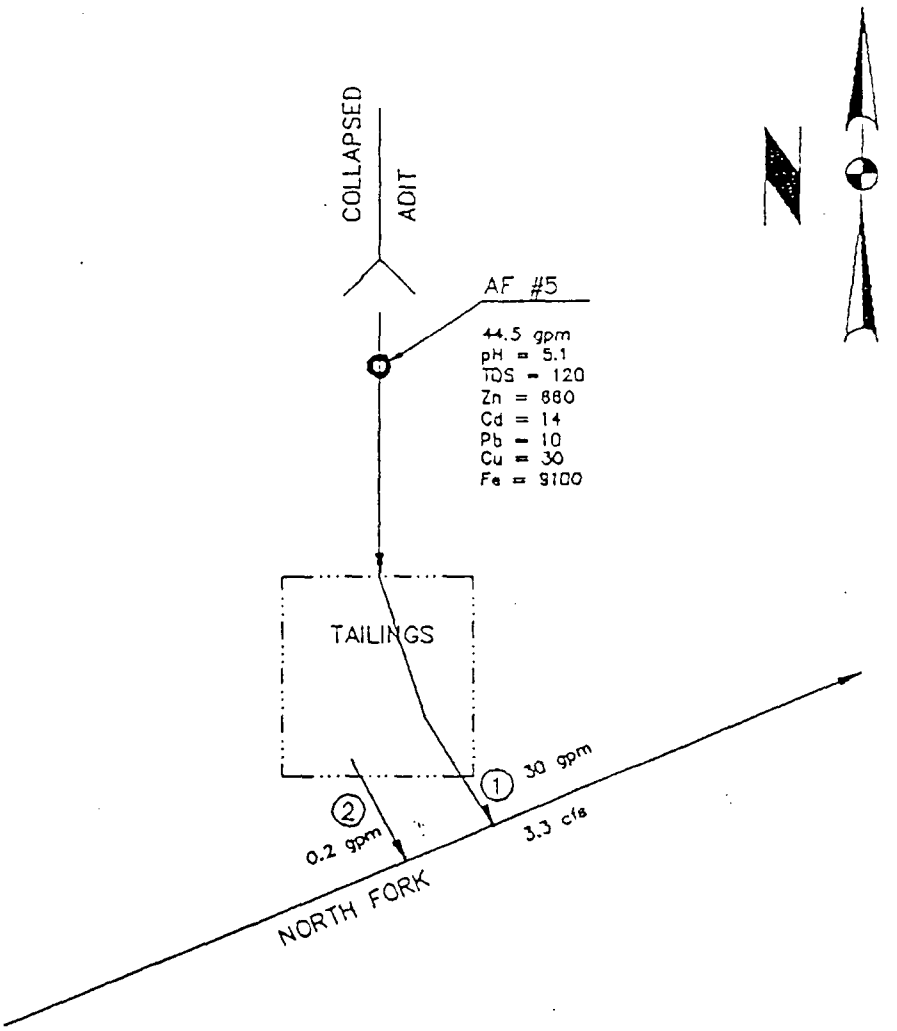


FIGURE 3. LOWER BOG SAMPLING PROGRAM

the tailings dump. The 1992 sampling program was designed to investigate the impacts of the portal discharge on the receiving waters (North Fork of the American Fork), the influence of the interaction of the tailings with the portal discharge, and the positive, if any, influence of the beaver pond on the discharging water quality. Figure 4 presents the sampling program conducted at the Pacific Mine site.

Field parameters were measured at the five sampling sites on consecutive days and were found to be repeatable during the sampling period. Drainage from the main portal (AF#6) is characterized by a near neutral (6.54) pH, iron precipitate and high concentrations of trace metals, primarily lead, zinc, copper and cadmium. Flow at the mouth of the main portal was gaged at 144 gpm or 0.32 cfs. At the base of the first bench and approximately 110 feet from the mouth of the main portal, the portal flow splits at a spoils dump and load out structure. The main flow is diverted to the north towards a beaver pond. A secondary flow is diverted to the south, commingling with a tailings dump. Much of the flow along this channel appears to be subsurface flow and may exit the site as seepage. Sample AF#1, which was collected from the tailings surface flow (measured at 6.5 gpm) is characterized by an increase in pH relative to the upstream sampling site (AF#6). Trace metals concentrations at this site either remained the same as AF#6 or decreased as a function of the increase in pH and Eh. The lead concentration, however increased significantly (approximately 10 times). This increase appears to be primarily tailings related. Previous sampling by Merritt, 1988 bore out this relationship though at a significantly greater magnitude (160 time increase in lead concentration). Dr. Merritt's sampling took place during a "rain storm" which may have influenced the magnitude of the trace metal concentrations.

A sample (AF#4) was collected at the mouth of the beaver pond prior to commingling with the waters of the North Fork drainage. Sampling data from this point (Figure 4) suggest that the beaver pond is efficiently removing most trace metals from solution. Most of the iron and copper were precipitated out of the waters prior to entrance into the beaver pond. Cadmium and zinc which exhibit similar geochemical behavior were reduced in concentration by approximately 50%. Lead concentrations were below detection limits at the mouth of the beaver pond.

Samples AF#3 and AF#2 were collected from the main stream at sites upstream and downstream of the Pacific Mine disturbance. The waters upstream of the mine disturbance meet all Class 3A standards for aquatic wildlife. Downstream of the mine (AF#2), the waters exceed state criteria for lead. This sample exhibits an impact of the mine discharge in its four-fold increase in zinc. Zinc levels approach the aquatic standard. Studies by Mangum, 1988 indicated that "the number of organisms (macroinvertebrates) had decreased approximately 70% from an upstream to a downstream station in the vicinity of the Pacific Mine."

Figure 5 characterizes the changes in water quality character (major anions and cations) at the Pacific Mine. Trilinear diagrams typically are used to present the relative chemical characteristics of waters collected from different locations. Qualitatively, if two samples or data points plot in the same field on a trilinear diagram a common source of ions is indicated. It is no surprise that the five samples plot within the same field and can be classified as calcium-magnesium bicarbonate waters. Both ground water and surface water sources at this site are strongly influenced by site geology. The portal discharge is more sulfate- rich than the receiving

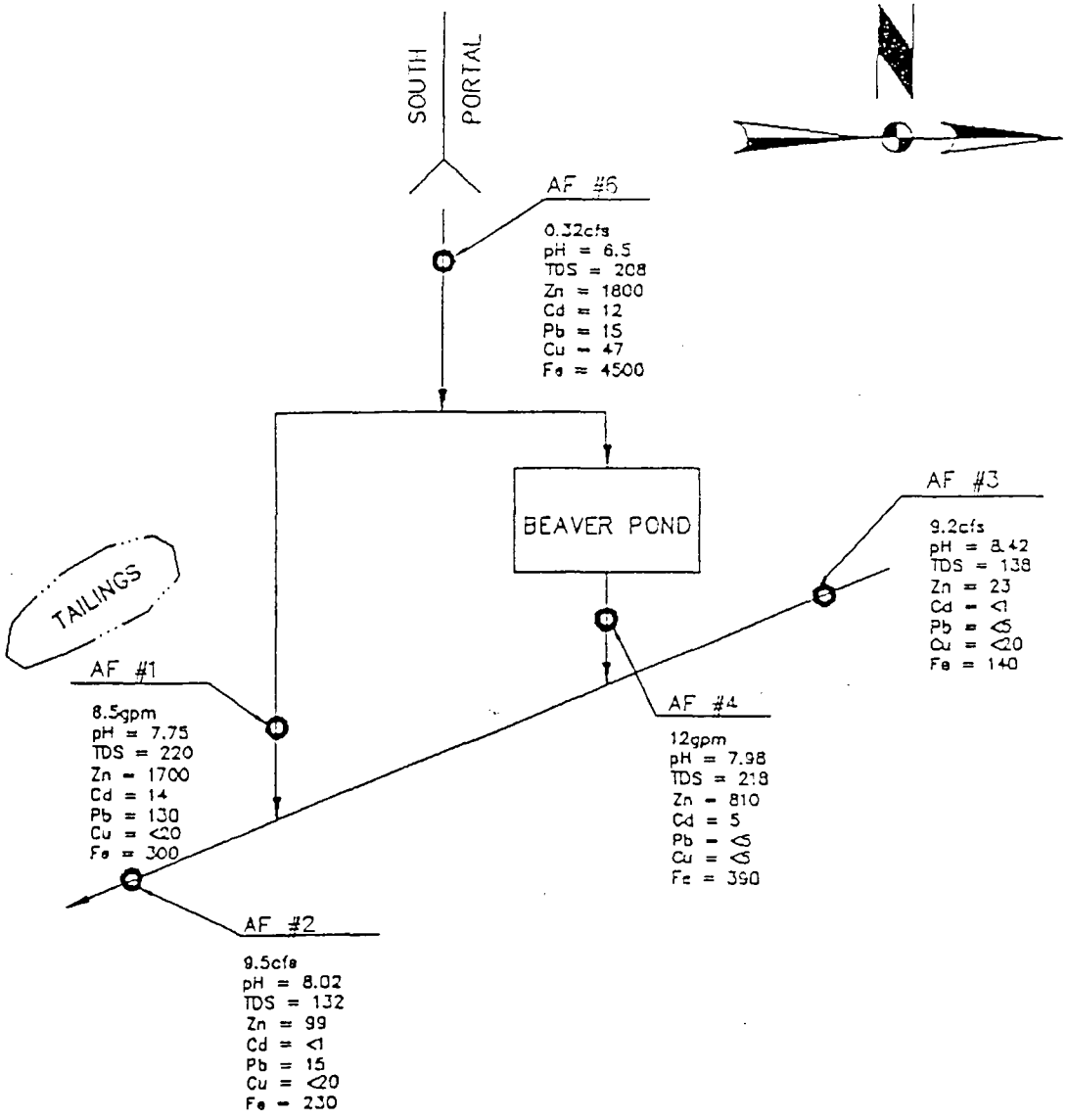


FIGURE 4. PACIFIC MINE SAMPLING PROGRAM

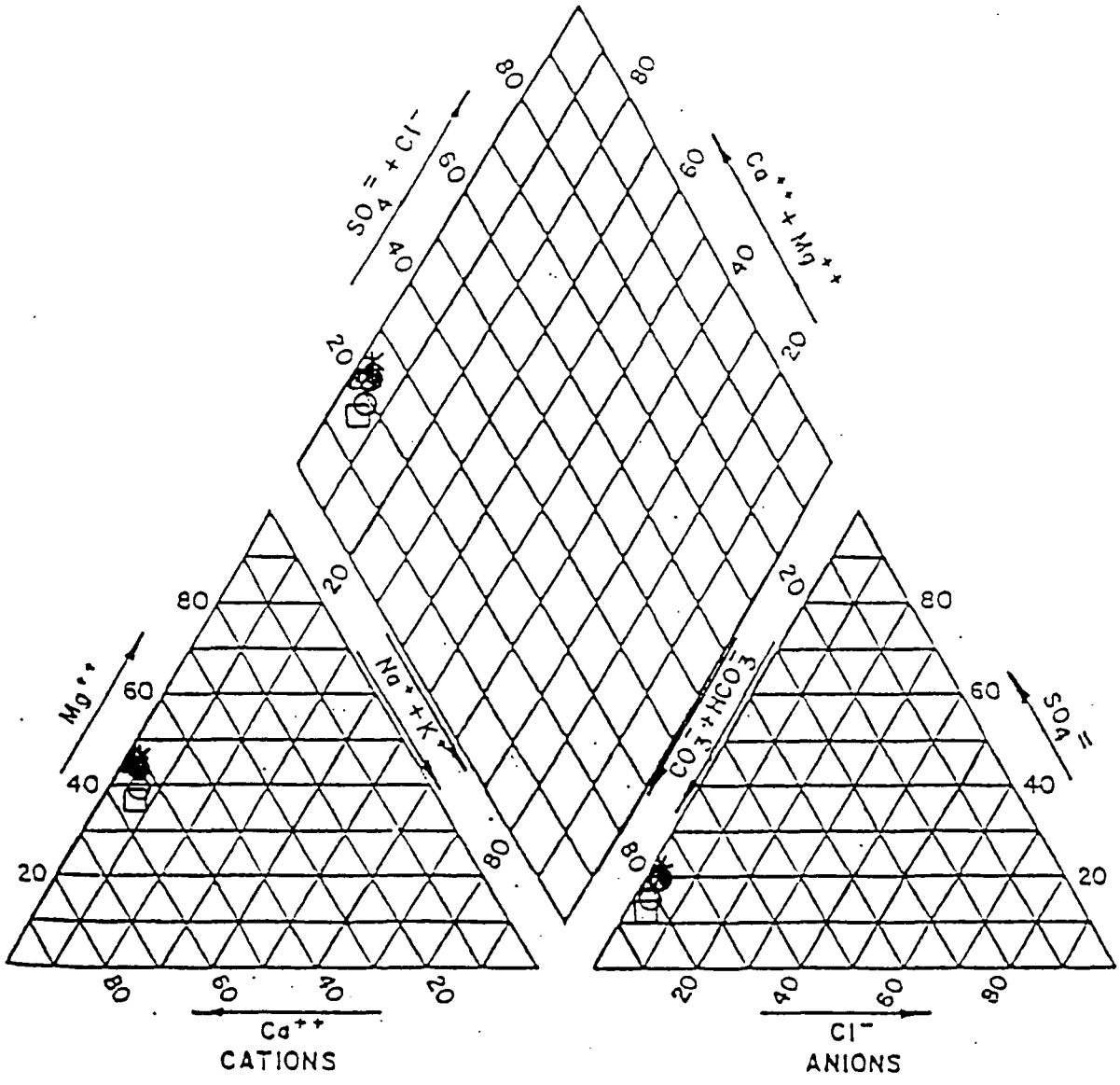


FIGURE 5. TRILINEAR DIAGRAM CHARACTERIZING THE WATER QUALITY AT PACIFIC MINE

LEGEND

△ AF #1
□ AF #2
○ AF #3
✳ AF #4
● AF #6

waters, yet the relative dilution of the portal discharge by the main streams waters (30:1) result in the "commonality of ions" portrayed on Figure 5. The portal discharge was measured at 0.32 cfs. The North Fork of the American Fork was gaged at 9.2 cfs.

3.3 Mary Ellen Gulch Mines

The Mary Ellen Gulch Mines are located along a south east-flowing tributary drainage to the North Fork of the American Fork at an average elevation of 9,100 feet AMSL. The site consists of a number of mine portals, abandoned structures, sedimentation ponds and detention structures, tailings and waste rock piles and spoil dumps. At the time of the field visit, active mining was ongoing at an adjacent and upstream mine. There was recent evidence of attempts to control the north portal drainage at the Mary Ellen Gulch Mine. Field parameters were collected from two discharging portals: the south portal (pH= 7.2; EC= 205 umhos/cm) and the north portal (pH= 5.95; EC= 180). Since the most significant discharge (70 gpm vs. 2.5 gpm) originates from the north portal, only that portal was sampled (Figure 6). The sampling program at the Mary Ellen Gulch Mines was developed to ascertain the impacts of the AMR portal discharge on the receiving waters, Mary Ellen Gulch. Prior to the initiation of this project it was understood that other abandoned mines and dumps were present in the upper basin, but that the Mary Ellen Gulch north portal may have had the most significant impact on the drainage and the fishery.

On the day the Mary Ellen Gulch Mines were sampled, the Globe Mine, immediately upstream of the AMR site was discharging "milky sediment-laden water". The discharge ceased at approximately 5:30 PM that day. In an attempt to collect the most representative downstream sample, AF#9, was collected at 7:15 PM. Fine sediment, a reflection of the Globe Mine discharge, was present on the stream gravels throughout the downstream reach.

The discharge from the main north portal (AF#7) was acidic (pH=5.95) with "yellow boy" and iron oxide precipitates near the mouth of the portal. The sample data from the 1992 sampling program indicated that the trace metal concentrations of this portal were not very high with only zinc, and iron exceeding aquatic standards. Previous sampling efforts (Merritt, 1988) found that elevated levels of copper, lead and cadmium originated from this portal. A sample collected upstream of the AMR disturbance and along Mary Ellen Gulch, AF#8, is characterized by good water quality. Class 3A aquatic standards were achieved for all parameters. The downstream sample, AF#9, may have been influenced by the discharges from the active underground mine above the AF#7 sampling location. Despite any such influence the 1992 sample analysis was very similar to the previous sample analysis by Merritt, 1988 which exhibited elevated concentrations of zinc, iron, copper and lead. Copper and lead appear to originate from some source other than the mine portal and may be related to the upstream Globe Mine or possibly to adjacent spoils and tailings dumps within the Mary Ellen Gulch basin.

A trilinear diagram (Figure 7) characterizes the transitional change in water quality character (major anions and cations) at the Mary Ellen Gulch Mines. The waters discharging from the portal (AF#7) are calcium- magnesium sulfate waters. The waters of Mary Ellen Gulch prior to "mixing" (AF#8) are calcium- magnesium bicarbonate type waters. Once these waters are mixed (AF#9) at the dilution ratio naturally occurring on-site (10:1) the waters change

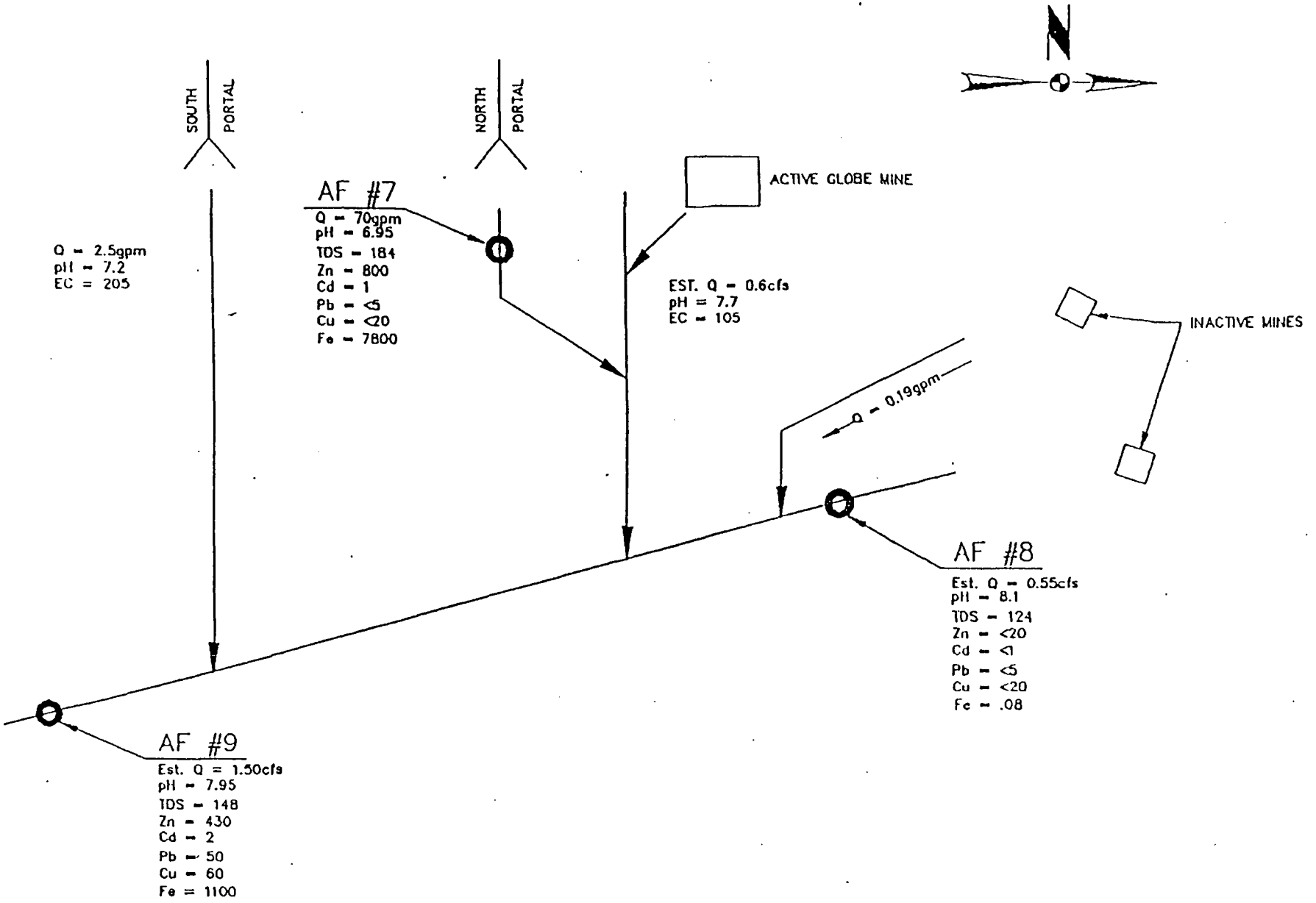


FIGURE 6. MARY ELLEN GULCH SAMPLING PROGRAM

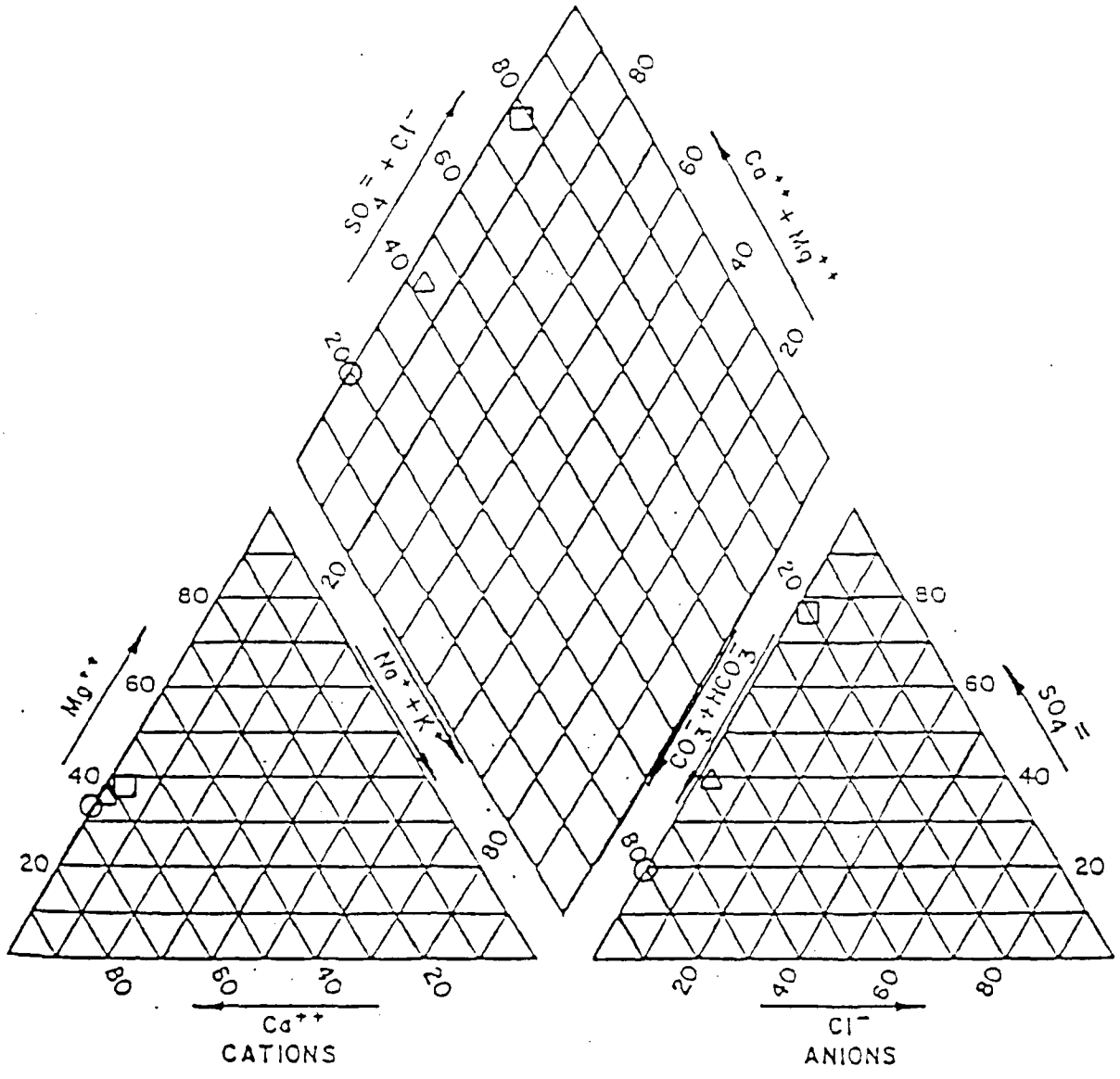


FIGURE 7. TRILINEAR DIAGRAM CHARACTERIZING THE WATER QUALITY AT MARY ELLEN GULCH

LEGEND
□ AF #7
○ AF #8
△ AF #9

chemistry to a calcium magnesium sulfate-bicarbonate- type water. The portal discharge was measured at 70 gpm. The main stem of Mary Ellen Gulch was gaged at 1.50 cfs.

4.0 Water Quality Impacts to the North Fork of the American Fork

4.1 Site Geochemistry

It is important to understand the geochemical changes, which occur as the mine discharge water exits the mine portals and before it enters the main stream. In general the water quality exiting the mine portals (Figure 8) is a calcium- magnesium sulfate-type water. The Pacific Mine drainage is predominantly calcium-magnesium bicarbonate water. The drainage from these portals are typically high in cadmium, copper, lead, iron and zinc. The anomalous concentrations of trace metals in the waters exiting these mine portals are directly related to the trace element geochemistry of the ore zones (Chapter 2.1). Copper and iron concentrations in water are strongly Eh and pH dependent. In the case of the mine portal discharge the majority of the iron precipitates out of solution as the waters become oxidized and the pH increases to neutral. The copper coprecipitates as a copper carbonate and is removed from the solution as Eh increases.

The trace metals zinc, cadmium and lead are somewhat more problematical since they are mobile under a wider range of Eh and pH conditions. Lead is the least mobile of these latter three elements and its solubility under oxidizing conditions is controlled by the presence of the carbonate ion and to a lesser degree, the sulfate ion. Under reducing conditions, lead will precipitate as a sulfide. Lead concentrations in the waters at the American Fork mines do not appear to be directly related to discharge from the mine portals but rather to contact with an outside source, either the tailings at the Pacific Mine or an adjacent upstream mine source, such as the Globe Mine within Mary Ellen Gulch.

Cadmium and zinc have similar geochemical behavior and are mobile under oxidizing conditions and nearly all pH conditions present at the American Fork sites. Cadmium levels are relatively low at the source and appear to rapidly decrease with dilution and to a certain degree by plant uptake. Chelation and/or adsorption of cadmium by organic matter in the beaver pond at the Pacific Mine appears to have a positive impact on trace metal concentration. Further discussion of these processes can be found in Kastning-Culp, et.al. 1992. The high concentrations of zinc are the most serious trace metal water quality problem in the American Fork Canyon. Zinc concentrations remain elevated at all stations sampled. Dilution of the portal discharge by the main channel flow appears to be the most significant mechanism for the reduction of zinc concentrations. Plant uptake of zinc, adsorption of zinc on hydrous manganese and iron oxides, adsorption and chelation of zinc by organic matter in the beaver pond at the Pacific Mine currently reduce concentrations of zinc in the effluent waters. Over time reducing conditions will develop within the beaver pond, accelerating the process of zinc removal as zinc sulfide precipitate. The limiting factor for sulfide precipitation at all American Fork sites is the degree of sulfate present in the water. With the exception of the Lower Bog site, nearly all project "receiving waters" are carbonate-rich.

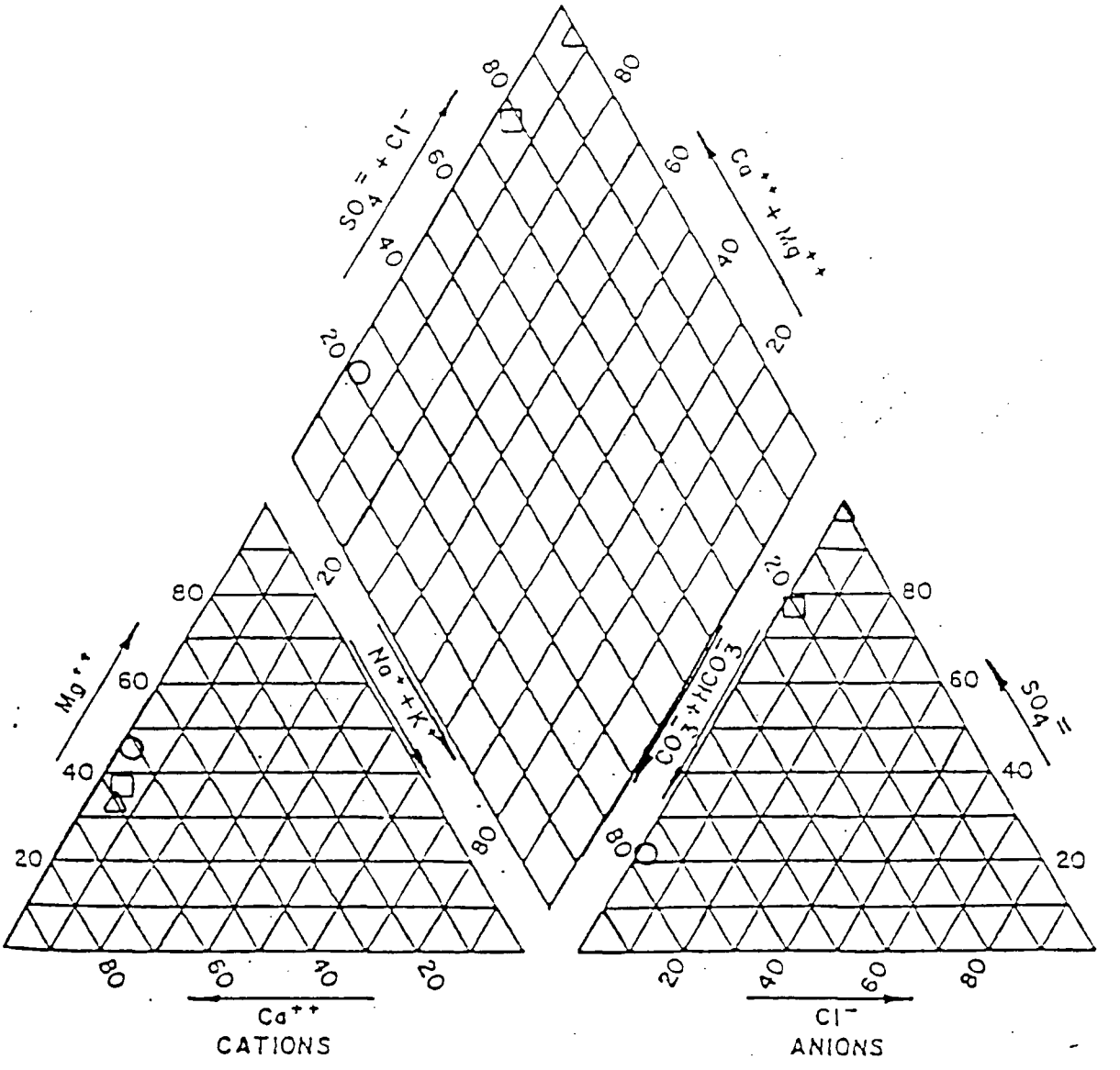


FIGURE 8. TRILINEAR DIAGRAM CHARACTERIZING THE WATER QUALITY AT MINE PORTALS

LEGEND
△ AF #5
□ AF #7
○ AF #6

it was felt to be most applic[illegible]e to this project because [illegible]
Fork Canyon and current field observations suggest that the 1992 sa[illegible]led water quality reflects a long term average condition.

Table 2 presents a summary of the American Fork water quality sampling program in relationship to the four-day average aquatic standard. On a site by site basis, samples AF#2 and AF#9 reflect the water quality at locations downstream of the disturbance and within the receiving waters, the American Fork and Mary Ellen Creek. No downstream sample was collected below the Lower Bog Mine. Previous sampling efforts by Mangum, 1988 document the zinc concentrations above and below the Lower Bog Mine.

Sample AF#2 (Table 2 and Figure 4) was collected approximately 800 feet below the Pacific Mine and exceeds aquatic fisheries standards for lead by a factor of four (4). Zinc concentrations at the downstream sample are slightly below the Aquatic Class 3A standards, yet are significantly elevated (four times) above background or upstream water quality. It is anticipated that zinc concentrations downstream of the Pacific Mine will exceed Class 3A water quality during certain periods of the year. The principal source of the elevated lead concentration at the Pacific Mine is the tailings dump adjacent to the North Fork of the American Fork. The principal source of the elevated zinc concentration is the water discharging from the south portal of the Pacific Mine. Based on the impacts of the Pacific Mine on the receiving water quality, remedial action at this site is recommended.

Sample AF#9 (Table 2 and Figure 6) characterizes the downstream water quality of Mary Ellen Gulch below the Mary Ellen Gulch Mine. This sample exceeds Class 3A water quality standards for cadmium, copper, iron, lead and zinc. Of these parameters, copper, lead and zinc are of primary concern. Copper exceeds standards by a factor of 4.5; lead exceeds standards by a factor of 13.2; zinc exceeds standards by a factor of 3.6. All parameters are significantly elevated above the upstream water quality sample AF#8. An insufficient number of samples were collected at this site to fully characterize the source of the trace metal contamination of Mary Ellen Gulch. The upstream sample, AF#8, eliminates the abandoned Yankee Mines (Figure 1) as a source of the metal contamination. Sample AF#7 was collected from the

Table 2. Water Quality Samples Which Exceed Class 3A Aquatic Fisheries Standards (4-Day Average).

Aquatic Standard*		Sample Concentration								
	4-Day	AF#1	AF#2	AF#3	AF#4	AF#5	AF#6	AF#7	AF#8	AF#9
pH	6.5-9.0 su	--	--	--	--	3.9	--	6.0	--	--
As	190 µg/l	--	--	--	--	--	--	--	--	--
Cd	1.3 µg/l	14	--	--	5	14	12	--	--	2
Cu	13.3 µg/l	--	--	--	--	30	47	--	--	60
Fe	1000 µg/l	--	--	--	--	9100	4500	7800	--	1100
Pb	3.8 µg/l	130	15	--	--	10	15	--	--	50
Se	5 µg/l	--	--	--	--	--	--	--	--	--
Zn	119 µg/l	1700	--	--	810	660	1800	800	--	430

* Hardness dependent criteria (pertaining to Cd, Cr, Cu, Pb, and Zn) assumes 115 mg/l total hardness

discharge waters of the Mary Ellen Gulch North Portal. Although cadmium and zinc were elevated at this source, only zinc exceeded Class 3A standards. It appears that an adjacent source must contribute toxic levels of trace metals, in particular lead and copper. That source could be the upstream and active Globe Mine or possibly runoff from the Mary Ellen Gulch tailings or the abandoned Mary Ellen Gulch South Portal. Before any mine reclamation can proceed at this site, additional water and soil sampling is necessary to clearly define the source of the contamination and maximize the positive effects of the reclamation.

No 1992 downstream sample was collected at the Lower Bog Mine site. Field parameters (Table 1) collected upstream and downstream of the mine discharge and along the North Fork of the American Fork suggest that there is minimal impact to the receiving waters (pH and TDS). Sampling of the discharging waters from the Lower Bog portal suggest that the waters exiting the mine portal reflect poor water quality, exceeding Class 3A standards (Table 2) for pH, cadmium,, iron, copper, lead and zinc. With the exception of pH and iron, the metals concentration of the Lower Bog Mine portal (AF#5) is less than the Pacific Mine portal (AF#6). When comparing the dilution ratio (receiving water flow to the portal discharge) it is apparent that there is greater dilution at the Lower Bog Mine than at the Pacific Mine. Assuming similar geochemical conditions, one can predict that the impact of the Lower Bog Mine discharge on the American Fork River will be less than the impact of the Pacific Mine discharge. The principal contaminants of interest will be zinc and possibly lead. Sampling conducted in 1988 (Mangum, 1988) indicated that zinc concentration will exceed Class 3A standards during the low water period of the year by a factor of 1.6. Because of the site's inaccessibility and the limited magnitude of the problem, no action is recommended at the Lower Bog Mine site.

4.3 Proposed Mine Reclamation

The 1992 water quality investigations quantified the environmental impacts of the AMR disturbances on the North Fork of the American Fork. Additional study is recommended at the Mary Ellen Gulch sites. No further action is recommended at the Lower Bog Mine. Sufficient water quality data are available at the Pacific Mine to document the nature and magnitude of the environmental problem at this site. AMR and/or USFS action is recommended at this site to mitigate the adverse impacts of past mining activities.

Available funding, land and mineral owner consent and final land use may restrict the degree of mine reclamation and ultimately its success in the mitigation of adverse impacts. On this basis a phased approach is recommended. Two interrelated sources of contamination will have to be addressed at the Pacific Mine: (1) portal discharge and (2) the tailings pond adjacent to the creek.

The primary source of contamination, the tailings dump is responsible for the elevated lead levels in the American Fork at sample site AF#2. Lead concentrations are transported to the creek via mine portal discharge as surface and subsurface flow, overland flow in response to rainfall and snowmelt events and bank erosion and channel migration of the American Fork against the tailings embankment. This study did not quantify the relative metals loading of each mechanism of transport.

The tailings dump should be isolated from the American Fork through a combination of cut and fill, rerouting of the portal discharge drainage and revetment of the existing American Fork channel banks. All portal discharges should be routed in a permanent diversion channel directly to the beaver pond. Because of the steep gradient of this channel, riprap protection will be required. The riprap will serve a multiple purpose of protecting the permanent diversion from erosion, oxidizing the discharging portal waters, raising the pH of the waters and coprecipitating the iron from solution, as well as serving as a permanent and maintenance-free barrier to ATV traffic attempting to access the tailings dump site. On site limestone or dolomitic rock can be utilized as riprap. Screening and sorting of this rock will be required to ensure a well graded riprap blanket.

The east slope of the tailings dump should be excavated from the vicinity of the North Fork of the American Fork channel. These materials should be transported to the top of the tailings dump and regraded to a "domed", yet relatively flat (less than 3% grade) surface. Ponded areas on the existing tailings dump should be eliminated. The outslope (east) of the regraded tailings dump should be graded to no steeper than a 4:1. The regraded surface of the tailings should be "deep ripped and limed" to elevate the pH of the tailings above 6.5. Topsoil can be borrowed from adjacent sites and placed on the regraded and limed surface. A minimum of 12 to 15 inches of topsoil should be placed on site. Care should be taken to separate A and B horizon material at the borrow site to ensure that an organic rich layer of A-horizon material is available for final cover. This same material will serve as a natural seed source and will reduce revegetation costs. The site should be broadcast seeded and harrowed. A riprap bank apron or at a minimum, toe slope riprap protection should be placed along the outslope, adjacent to the creek. Depending on the characteristics of available rock, this riprap may have to be imported to the site. Wooden cribs or similar biotechnical slope protection may be substituted for riprap. However longevity of the design should be addressed.

Additional treatment of the discharging portal waters can be accomplished through the construction of a wetland on the upper terrace immediately above the beaver pond. The purpose of this wetland is to accomplish primary treatment of zinc and cadmium, prior to the water's entrance into the beaver pond. The beaver pond would behave as a secondary treatment facility. The wetland would be excavated into the surface adjacent to the "loadout" area. Approximately 4,000 square feet of surface is available for wetland construction. An impermeable liner and coarse limestone gravels would be placed at the bottom of the excavation. Organic matter (humus, manure, soils borrowed from the beaver pond area) would be backfilled above the gravel layer. The site would be topsoiled and planted with the appropriate locally available vegetation. Kastning-Culp, 1992 documents the chelation properties and plant uptake of zinc by local vegetative species. Soil and moss berms would be constructed within the wetland to prevent short-circuiting of the influent waters. The wetland would discharge directly to a ditch, which would flow to the beaver pond and ultimately to the North Fork of the American Fork.

Under a phased approach, the initial reclamation should entail a channel diversion of all portal discharges to the beaver pond. "Follow-up" water quality sampling should take place to evaluate the beaver pond's ability to treat the additional waters. Later phases should include the limited cut and fill and regrading of the tailings dump, channel stabilization of the North Fork in the vicinity of the tailings dump and the construction of the wetland.

A conceptual design of the Pacific Mine proposed reclamation is presented on Figure 9. Surveying and mapping should be completed prior to the finalization of the designs. The design process should include an evaluation of design hydrology, channel hydraulics, soils and vegetation requirements, final earthwork, preparation of final plans and specifications.

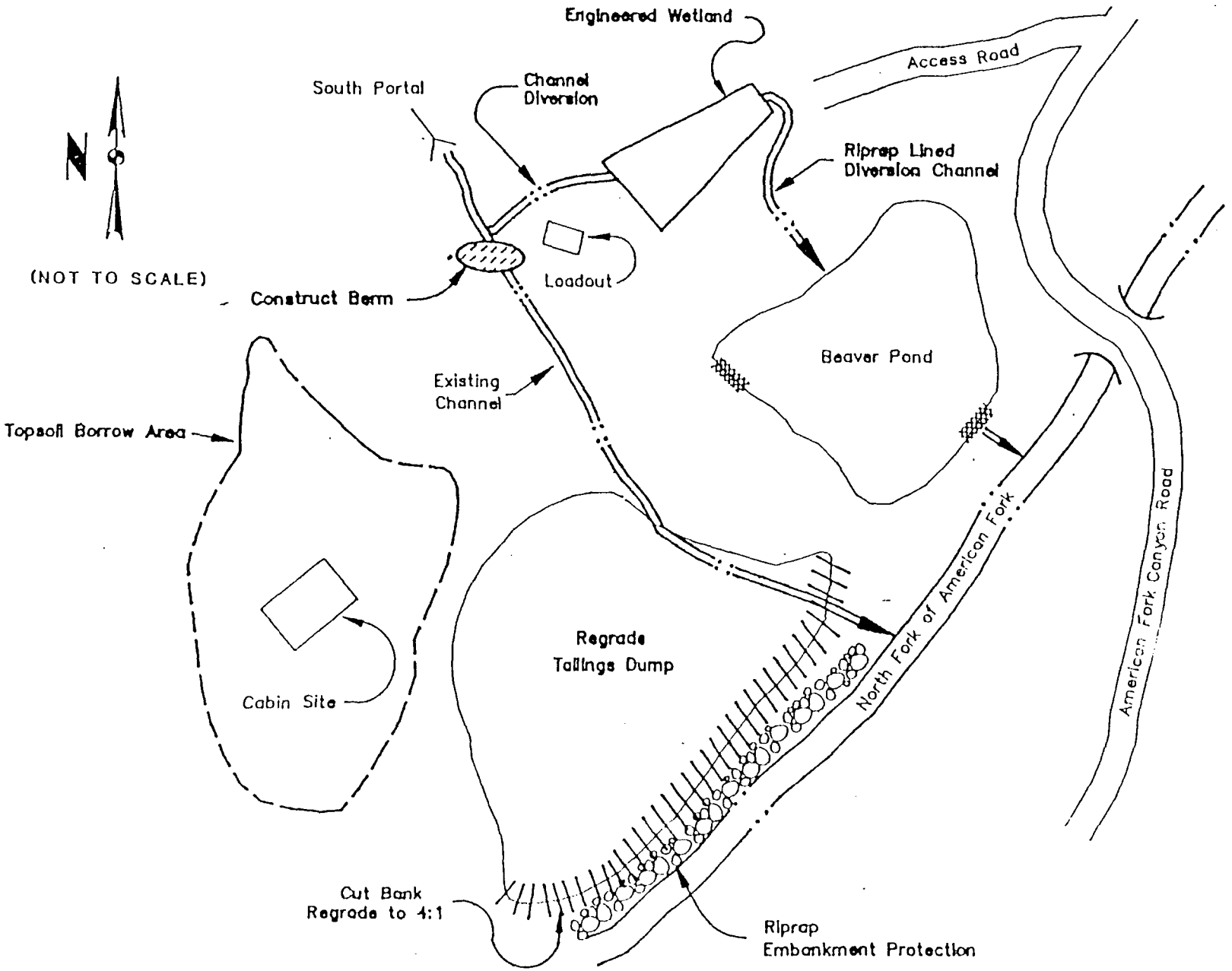
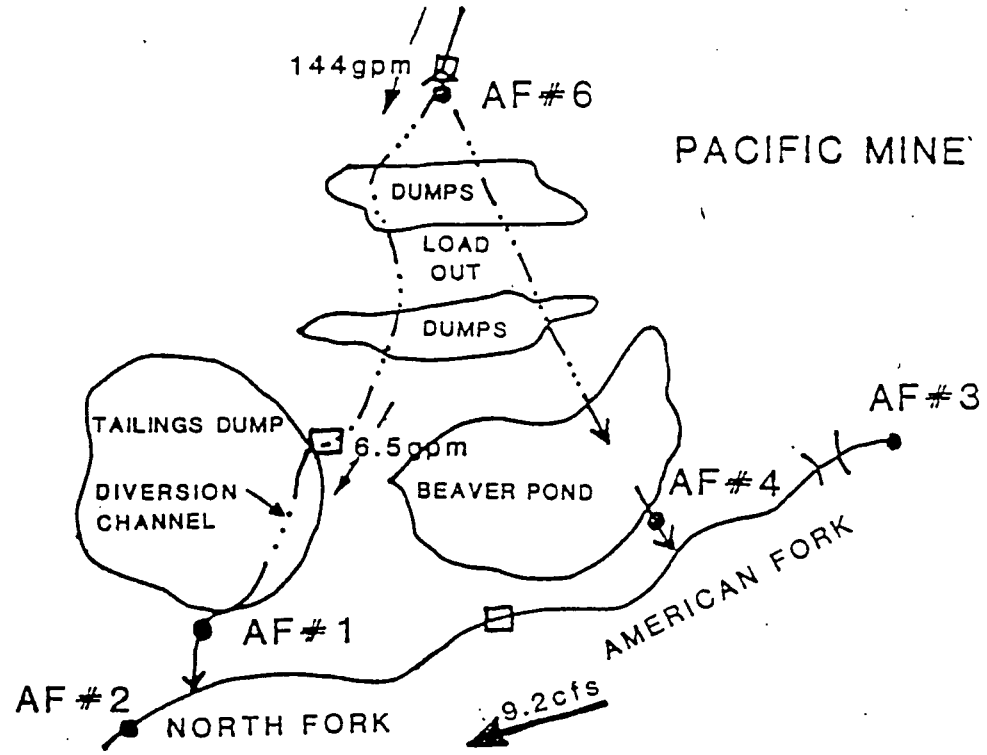
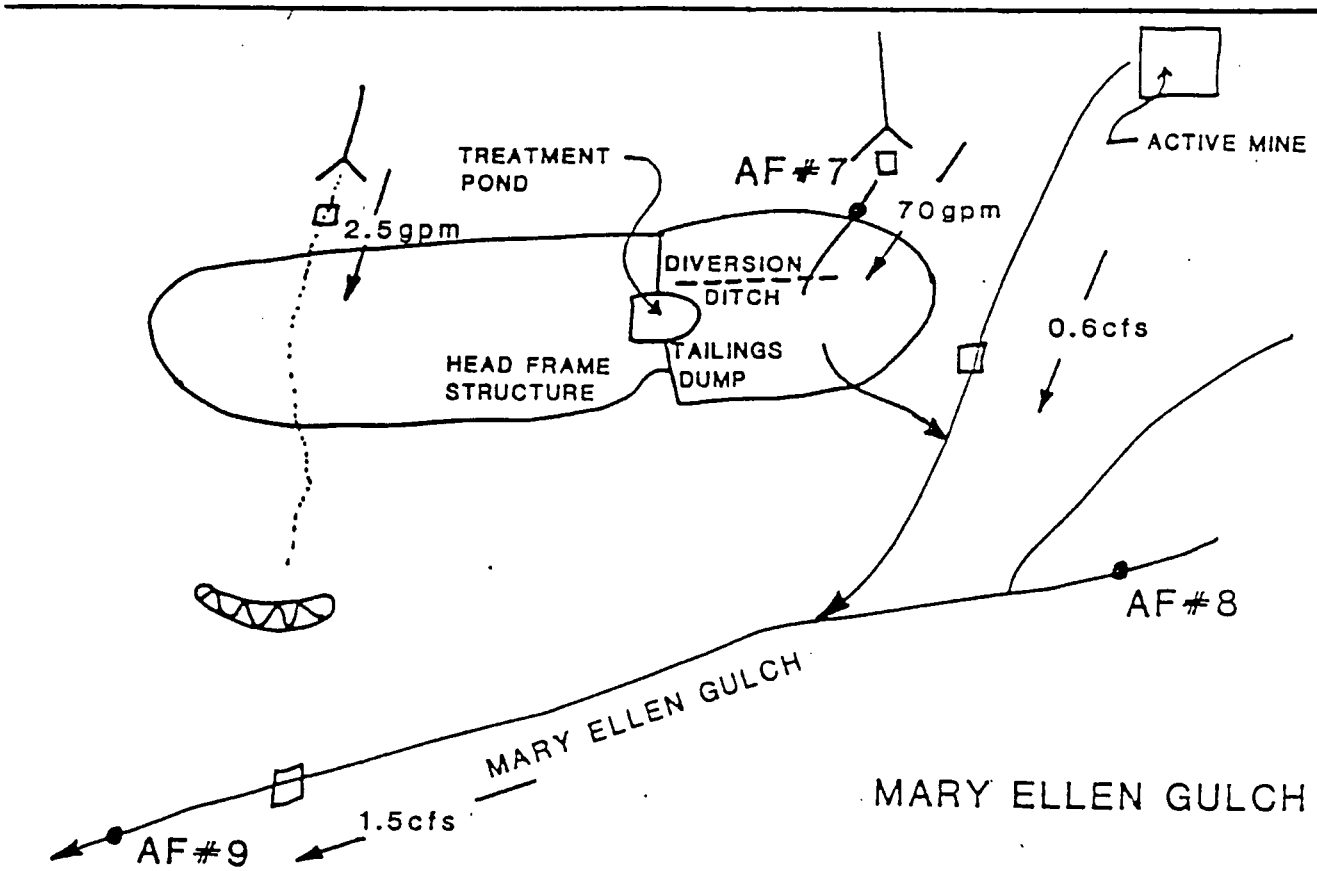


FIGURE 9 CONCEPTUAL DESIGN OF RECLAMATION AT THE PACIFIC MINE

APPENDIX A

WATER QUALITY DATA


144gpm
AF#6
PACIFIC MINE
DUMPS
LOAD OUT
DUMPS
TAILINGS DUMP
6.5gpm
DIVERSION CHANNEL
BEAVER POND
AF#4
AF#3
AF#1
AMERICAN FORK
AF#2
NORTH FORK
9.2cfs


TREATMENT POND
AF#7
ACTIVE MINE
2.5gpm
70gpm
DIVERSION DITCH
0.6cfs
HEAD FRAME STRUCTURE
TAILINGS DUMP
AF#8
MARY ELLEN GULCH
MARY ELLEN GULCH
1.5cfs
AF#9

AMERICAN FORK #1

Pacific Mine seepage above confluenc
w/ American Fork
pH = 7.75
temp. = 18.3
EC = 325
color = clear

UTAH STATE HEALTH DEPARTMENT
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

Description:	AMERICAN FORK #1				
Site ID:		Source:	00	Date of Review and QA Validation	
Cost Code:	3508			Inorganic Review:	92/07/29
Lab Number:	9204265	Type:	04	Organic Review:	
Sample Date:	92/07/08	Time:	12:45	Radiochemistry Review:	
Tot. Cations:	68			Microbiology Review:	
Tot. Anions:	140	mg/l	Cations:	4.1 me/l	
Grand Total:	208	mg/l	Anions:	4.2 me/l	

Laboratory Analyses

L-pH *	7.9	D-Calcium	43 mg/l
D-Magnesum	23 mg/l	D-Potassum	<1 mg/l
Bicarbnate	206 mg/l	Carbonate	0 mg/l
Chloride	<1 mg/l	Sulfate	38.045 mg/l
Tot. Alk.	169 mg/l	TDS @ 180C	220 mg/l
H+Arsenic	5.0 ug/l	H+Barium	0.11 mg/l
H+Cadmium	14 ug/l	H+Chromium	<5.0 ug/l
H+Copper	<20.0 ug/l	H+Iron	0.3 mg/l
H+Lead	130.0 ug/l	H+Mangan	92.0 ug/l
H+Selenium	<5.0 ug/l	H+Zinc	1700.0 ug/l

PH pH should be performed as a field test.

AMERICAN FORK #2

North Fork of American Fork below Pacific Mine

pH = 8.05
temp = 13.3
EC = 170
color = clear

UTAH STATE HEALTH DEPARTMENT
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

Description:	AMERICAN FORK #2				
Site ID:		Source:	00	Date of Review and QA Validation	
Cost Code:	3508			Inorganic Review:	92/07/29
Lab Number:	9204266	Type:	04	Organic Review:	
Sample Date:	92/07/08	Time:	13:05	Radiochemistry Review:	
Tot. Cations:	42			Microbiology Review:	
Tot. Anions:	80	mg/l	Cations:	2.5 me/l	
Grand Total:	122	mg/l	Anions:	2.5 me/l	

Laboratory Analyses

L-pH *	8.0	D-Calcium	28 mg/l
D-Magnesum	12 mg/l	D-Potassum	<1 mg/l
Bicarbnate	128 mg/l	Carbonate	0 mg/l
Chloride	<1 mg/l	Sulfate	15.889 mg/l
Tot. Alk.	105 mg/l	TDS @ 180C	132 mg/l
H+Arsenic	<5.0 ug/l	H+Barium	0.053 mg/l
H+Cadmium	<1 ug/l	H+Chromium	<5.0 ug/l
H+Copper	<20.0 ug/l	H+Iron	0.23 mg/l
H+Lead	15.0 ug/l	H+Mangan	21.0 ug/l
H+Selenium	<5.0 ug/l	H+Zinc	99.0 ug/l

PH pH should be performed as a field test.

AMERICAN FORK #3

N. Fork of American Fork above Pacific Mine

pH = 8.42
temp = 11.3
EC = 150
Color = clear

UTAH STATE HEALTH DEPARTMENT
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

Description:	AMERICAN FORK #3				
Site ID:		Source:	00	Date of Review and QA Validation	
Cost Code:	3508			Inorganic Review:	92/07/29
Lab Number:	9204257	Type:	04	Organic Review:	
Sample Date:	92/07/08	Time:	12:30	Radiochemistry Review:	
Tot. Cations:	39			Microbiology Review:	
Tot. Anions:	77	mg/l	Cations:	2.3 me/l	
Grand Total:	116	mg/l	Anions:	2.3 me/l	

Laboratory Analyses

L-pH *	7.9	D-Calcium	26 mg/l
D-Magnesum	11 mg/l	D-Potassum	<1 mg/l
Bicarbnate	119 mg/l	Carbonate	0 mg/l
Chloride	<1 mg/l	Sulfate	17.572 mg/l
Tot. Alk.	97 mg/l	TDS @ 180C	138 mg/l
H+Arsenic	<5.0 ug/l	H+Barium	0.043 mg/l
H+Cadmium	<1 ug/l	H+Chromium	<5.0 ug/l
H+Copper	<20.0 ug/l	H+Iron	0.14 mg/l
H+Lead	<5.0 ug/l	H+Mangan	16.0 ug/l
H+Selenium	<5.0 ug/l	H+Zinc	23.0 ug/l

PH pH should be performed as a field test.

AMERICAN FORK #4

Seepage Discharge from Beaver Pond
above confluence of American Fork
pH. = 7.98
temp. = 11.7
EC = 280
color = clear

UTAH STATE HEALTH DEPARTMENT
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

Description:	AMERICAN FORK #4				
Site ID:		Source:	00	Date of Review and QA Validation	
Cost Code:	3508			Inorganic Review:	92/07/29
Lab Number:	9204268	Type:	04	Organic Review:	
Sample Date:	92/07/08	Time:	12:15	Radiochemistry Review:	
Tot. Cations:	68			Microbiology Review:	
Tot. Anions:	136	mg/l	Cations:	4.1 me/l	
Grand Total:	204	mg/l	Anions:	4.1 me/l	

Laboratory Analyses

L-pH *	7.7	D-Calcium	42 mg/l
D-Magnesum	23 mg/l	D-Potassum	<1 mg/l
Bicarbnate	202 mg/l	Carbonate	0 mg/l
Chloride	<1 mg/l	Sulfate	35.646 mg/l
Tot. Alk.	165 mg/l	TDS @ 180C	218 mg/l
H+Arsenic	<5.0 ug/l	H+Barium	0.086 mg/l
H+Cadmium	5 ug/l	H+Chromium	<5.0 ug/l
H+Copper	<20.0 ug/l	H+Iron	0.39 mg/l
H+Lead	<5.0 ug/l	H+Mangan	18.0 ug/l
H+Selenium	<5.0 ug/l	H+Zinc	810.0 ug/l

PH pH should be performed as a field test.

AMERICAN FORK #6

Seepage from Pacific Mine @ Portal
pH. = 6.54
temp. = 7.8
EC = 230
color = sl. Cloudy, red, Fe ppt

UTAH STATE HEALTH DEPARTMENT
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

Description:	AMERICAN FORK #6				
Site ID:		Source:	00	Date of Review and QA Validation	
Cost Code:	3508			Inorganic Review:	92/07/29
Lab Number:	9204270	Type:	04	Organic Review:	
Sample Date:	92/07/08	Time:	15:30	Radiochemistry Review:	
Tot. Cations:	65			Microbiology Review:	
Tot. Anions:	135 mg/l		Cations:	3.9 me/l	
Grand Total:	200 mg/l		Anions:	4.0 me/l	

Laboratory Analyses

L-pH *	6.9	D-Calcium	40 mg/l
D-Magnesum	22 mg/l	D-Potassum	<1 mg/l
Bicarbnate	191 mg/l	Carbonate	0 mg/l
Chloride	1.4 mg/l	Sulfate	39.473 mg/l
Tot. Alk.	156 mg/l	TDS @ 180C	208 mg/l
H+Arsenic	20.0 ug/l	H+Barium	0.084 mg/l
H+Cadmium	12 ug/l	H+Chromium	<5.0 ug/l
H+Copper	47.0 ug/l	H+Iron	4.5 mg/l
H+Lead	15.0 ug/l	H+Mangan	15.0 ug/l
H+Selenium	<5.0 ug/l	H+Zinc	1800.0 ug/l

PH pH should be performed as a field test.

AMERICAN FORK #7

North Portal Mary Ellen Gulch
pH. = 5.95
temp. = 8.0
EC = 180
Color = clear, Fep

UTAH STATE HEALTH DEPARTMENT
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

Description:	AMERICAN FORK #7				
Site ID:		Source:	00	Date of Review and QA Validation	
Cost Code:	350B			Inorganic Review:	92/08/06
Lab Number:	9204271	Type:	04	Organic Review:	
Sample Date:	92/07/08	Time:	17:05	Radiochemistry Review:	
Tot. Cations:	44			Microbiology Review:	
Tot. Anions:	118	mg/l	Cations:	2.6 me/l	
Grand Total:	162	mg/l	Anions:	2.7 me/l	

Laboratory Analyses

L-pH *	6.0	D-Calcium	30 mg/l
D-Magnesum	12 mg/l	D-Potassum	1.2 mg/l
Bicarbnate	30 mg/l	Carbonate	0 mg/l
Chloride	<1 mg/l	Sulfate	102.13 mg/l
Tot. Alk.	25 mg/l	TDS @ 180C	184 mg/l
H+Arsenic	70.0 ug/l	H+Barium	0.014 mg/l
H+Cadmium	1 ug/l	H+Chromium	<5.0 ug/l
H+Copper	<20.0 ug/l	H+Iron	7.8 mg/l
H+Lead	<5.0 ug/l	H+Mangan	210.0 ug/l
H+Selenium	<5.0 ug/l	H+Zinc	800.0 ug/l

PH pH should be performed as a field test.

AMERICAN FORK #8

Mary Ellen Gulch above AML disturban
pH. = 8.1
temp. = 9.1
EC = 140
color = clear

UTAH STATE HEALTH DEPARTMENT
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

Description:	AMERICAN FORK #8				
Site ID:		Source:	00	Date of Review and QA Validation	
Cost Code:	3508			Inorganic Review:	92/07/29
Lab Number:	9204272	Type:	04	Organic Review:	
Sample Date:	92/07/08	Time:	17:50	Radiochemistry Review:	
Tot. Cations:	37			Microbiology Review:	
Tot. Anions:	73 mg/l		Cations:	2.1 me/l	
Grand Total:	110 mg/l		Anions:	2.2 me/l	

Laboratory Analyses

L-pH *	8.0	D-Calcium	25 mg/l
D-Magnesum	10 mg/l	D-Potassum	<1 mg/l
Bicarbnate	106 mg/l	Carbonate	0 mg/l
Chloride	<1 mg/l	Sulfate	19.91 mg/l
Tot. Alk.	87 mg/l	TDS @ 180C	124 mg/l
H+Arsenic	<5.0 ug/l	H+Barium	0.044 mg/l
H+Cadmium	<1 ug/l	H+Chromium	<5.0 ug/l
H+Copper	<20.0 ug/l	H+Iron	0.08 mg/l
H+Lead	<5.0 ug/l	H+Mangan	<5.0 ug/l
H+Selenium	<5.0 ug/l	H+Zinc	<20.0 ug/l

PH pH should be performed as a field test.

AMERICAN FORK #9

Mary Ellen Gulch below AML disturb
pH. = 7.95
temp. = 10.4
EC = 170
Color = milky

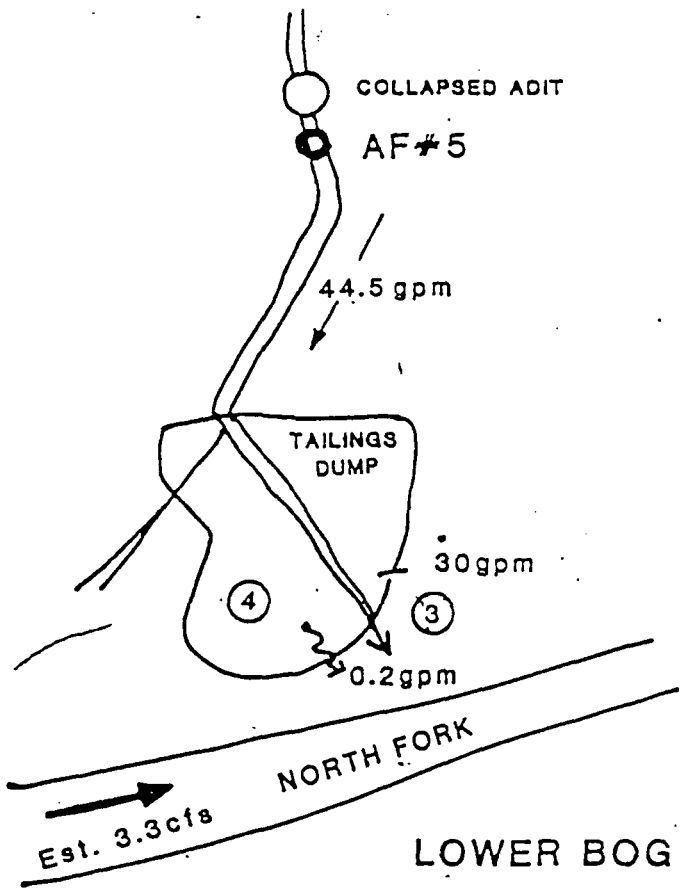
UTAH STATE HEALTH DEPARTMENT
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

Description:	AMERICAN FORK #9				
Site ID:		Source:	00	Date of Review and QA Validation	
Cost Code:	3508			Inorganic Review:	92/07/29
Lab Number:	9204273	Type:	04	Organic Review:	
Sample Date:	92/07/08	Time:	19:15	Radiochemistry Review:	
Tot. Cations:	43			Microbiology Review:	
Tot. Anions:	97	mg/l	Cations:	2.5 me/l	
Grand Total:	140	mg/l	Anions:	2.6 me/l	

Laboratory Analyses

L-pH *	7.9	O-Calcium	29 mg/l
O-Magnesum	12 mg/l	O-Potassum	<1 mg/l
Bicarbnate	94 mg/l	Carbonate	0 mg/l
Chloride	<1 mg/l	Sulfate	49.504 mg/l
Tot. Alk.	77 mg/l	TDS @ 180C	148 mg/l
H+Arsenic	10.0 ug/l	H+Barium	0.034 mg/l
H+Cadmium	2 ug/l	H+Chromium	<5.0 ug/l
H+Copper	60.0 ug/l	H+Iron	1.1 mg/l
H+Lead	50.0 ug/l	H+Mangan	60.0 ug/l
H+Selenium	<5.0 ug/l	H+Zinc	430.0 ug/l

PH pH should be performed as a field test.



Description:	AMERICAN FORK #5				
Site ID:		Source:	00	Date of Review and QA Validation	
Cost Code:	3500			Inorganic Review:	92/07/29
Lab Number:	9204269	Type:	04	Organic Review:	
Sample Date:	92/07/08	Time:	14:25	Radiochemistry Review:	
Tot. Cations:	17			Microbiology Review:	
Tot. Anions:	66	mg/l	Cations:	0.9 me/l	
Grand Total:	83	mg/l	Anions:	1.4 me/l	

Laboratory Analyses

L-pH *	3.9	D-Calcium	11 mg/l
D-Magnesum	3.6 mg/l	D-Potassum	1.1 mg/l
Bicarbnate	0 mg/l	Carbonate	0 mg/l
Chloride	1.4 mg/l	Sulfate	64.368 mg/l
Tot. Alk.	0 mg/l	TDS @ 180C	120 mg/l
H+Arsenic	<5.0 ug/l	H+Barium	0.035 mg/l
H+Cadmium	14 ug/l	H+Chromium	<5.0 ug/l
H+Copper	30.0 ug/l	H+Iron	9.1 mg/l
H+Lead	10.0 ug/l	H+Mangan	290.0 ug/l
H+Selenium	<5.0 ug/l	H+Zinc	660.0 ug/l

AMERICAN FORK #5

Lower Bog portal discharge
pH. = 5.11
TDS = 80 ppm
temp = 10.1
Color = clear, Fe ppt

UTAH STATE HEALTH DEPARTMENT
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

Description:	AMERICAN FORK #5				
Site ID:		Source:	00	Date of Review and QA Validation	
Cost Code:	3508			Inorganic Review:	92/07/29
Lab Number:	9204269	Type:	04	Organic Review:	
Sample Date:	92/07/08	Time:	14:25	Radiochemistry Review:	
Tot. Cations:	17			Microbiology Review:	
Tot. Anions:	66 mg/l		Cations:	0.9 me/l	
Grand Total:	83 mg/l		Anions:	1.4 me/l	

Laboratory Analyses

L-pH *	3.9	D-Calcium	11 mg/l
D-Magnesum	3.6 mg/l	D-Potassum	1.1 mg/l
Bicarbnate	0 mg/l	Carbonate	0 mg/l
Chloride	1.4 mg/l	Sulfate	64.368 mg/l
Tot. Alk.	0 mg/l	TDS @ 180C	120 mg/l
H+Arsenic	<5.0 ug/l	H+Barium	0.035 mg/l
H+Cadmium	14 ug/l	H+Chromium	<5.0 ug/l
H+Copper	30.0 ug/l	H+Iron	9.1 mg/l
H+Lead	10.0 ug/l	H+Mangan	290.0 ug/l
H+Selenium	<5.0 ug/l	H+Zinc	660.0 ug/l

PH pH should be performed as a field test.

APPENDIX B

GAGING DATA

PAGE ____ OF ____

DISCHARGE MEASUREMENT NOTES

LOCATION Mary Ellen Gulch Bl. Portal Discharge (800 feet)

TE 7/8/92 PARTY Lidstone/Mesch

EQUIPMENT Pygmy METHOD Area Velocity WEATHER cloudy overcast

CROSS SECTION GS#2 FLOW rapid

INITIAL GAGE READING/TIME 6:20 PM FINAL GAGE READING/TIME 7:00 PM

COMMENTS Control section at bedrock outcrop; high flows overbank bedrock outcrop to gravel bar; RB well vegetated, cobbles, willow bed material; sands, gravels on bed; some silt deposit. Mannings n=.055 bed, n=.055-.070 ove bar

Distance From Initial Point (ft)	Width (ft)	Depth (ft)	Observation Depth @0.6	Revolutions	Time In Seconds	Velocity (ft/s) At Point	Velocity (ft/s) Mean	Area (ft^2)	Discharge (cfs)
LB no	0.0	0.0							
flow									
LB EOW	3.2	0.0				0			
vertical							0.76	0.17	0.13
"	3.5	0.58		91	60	1.52			
							1.59	0.41	0.65
	4.2	0.58		101	60	1.66			
							1.47	0.32	0.47
	4.8	0.50		77	60	1.28			
							1.32	0.12	0.16
	5.1	0.33		81	60	1.35			
							0.67	0.07	0.05
RB EOW	5.5	0				0			
									1.46 cfs
						Add 12-20 gpm est flow			
						from seepage along LB			
									1.50

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PAGE ____ OF ____

DISCHARGE MEASUREMENT NOTES

LOCATION N. Fork American Fork Ab. Pacific Mine Discharge

DATE 7/8/92 PARTY Lidstone/Mesch

EQUIPMENT Pygmy METHOD ____ WEATHER cloudy/overcast

CROSS SECTION GS #1 FLOW clear rapid

INITIAL GAGE READING/TIME 10:05 AM FINAL GAGE READING/TIME 10:40 AM

COMMENTS LB looking DS = 0.00. Bed material 2-4" cobbles, some gravels - channel banks overgrown with semi dense overstory

Mannings "n" over channel length 0.045 - 0.050; OB = 0.065

Distance From Initial Point (ft)	Width (ft)	Depth (ft)	Observation Depth @0.6	Revolutions	Time In Seconds	Velocity (ft/s) At Point	Velocity (ft/s) Mean	Area (ft^2)	Discharge (cfs)
LB EOW	0.0	0.0	0.0	----	----				
							0.79	0.36	0.28
	2.2	0.33		47	30	1.57			
							2.05	0.36	0.74
	3.0	0.58		76	30	2.52			
							2.73	0.67	1.83
	4.0	0.75		44	15	2.93			
							2.55	0.73	1.86
	5.0	0.71		32	15	2.16			
							2.46	0.73	1.80
	6.0	0.75		41	15	2.76			
							2.19	0.71	1.55
	7.0	0.67		24	15	1.62			
							1.31	0.59	0.77
	8.0	0.50		30	30	0.99			
							0.86	0.31	0.27
	8.7	0.42		22	30	0.72			
							0.36	0.27	0.10
	10.0	0.0		0	0	0.00			
									9.2 cfs

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TABBED PAGE
F

American Fork Canyon - Water Samples

Table values in micrograms per liter (ppb)
numbers in RED exceed water quality criteria

Sample Location	Date	Ag	Al	As	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Tl
NFAF ab Pacific Mine	08/26/1998 T	<2.0	95	<5.0	46		<1.0		<5.0	<12	2120	<0.2	22		<3		<1.0	
NFAF bl Pacific Mine	08/26/1998 T	<2.0	57	<5.0	47		<1.0		<5.0	<12	1960	<0.2	19		16		<1.0	
Dutchman Flat bl culvert	09/08/1998 T	<2.0	40	<5.0	57		<1.0		<5.0	<12	1280	<0.2	14		35		<1.0	
Mary Ellen Cr. ab Globe	09/03/1998 D	<2.0	330	<5.0	23		1.6		<5.0	26	138	<0.2	12		3.4		<1.0	
Mary Ellen Mine North. adit	09/03/1998 D	<2.0	240	160	22		1.9		<5.0	24	18500	<0.2	140		31		<1.0	
Mary Ellen Gulch, lower pond	08/18/1998 D	<2.0	<30	<5.0	86		1.5		6.7	<12	23.9	<0.2	22		16		<1.0	
Mary Ellen Gulch, lower pond	08/18/1998 T	<2.0	74	<5.0	97		1.5		<5.0	25	682	<0.2	17		45		<1.0	
Mary Ellen Gulch, creek bl mines	08/18/1998 D	<2.0	44	<5.0	43		1.3		<5.0	<12	<20	<0.2	47		18		<1.0	
Mary Ellen Gulch, creek bl mines	08/18/1998 T	<2.0	190	9.7	41		2.3		<5.0	46	1550	<0.2	47		50		<1.0	
Mary Ellen Cr. ab North Fork	09/08/1998 T	<2.0	380	9.2	73		1.5		<5.0	27	1460	<0.2	60		93		<1.0	
State Water Quality Criteria																		
(3A - cold water fish) (ppb)	4-day	0.12	87	190			1.1			12	1000	0.012		160	3.2		5.0	
	1-hour	4.1	750	360			3.9		16	18		2.4		1400	82		20	
(1C - Domestic use) (ppb)	Maximum	50		50	1000		10		50			2			50		10	
(4 - agriculture) (ppb)	Maximum			100			10		100	200					100		50	
												(ppm)						
NF American Fork ab Pacific	10/21/1998 T	<2.0	31	<5.0	39		<1.0		<5.0	<12	0.076	<0.2	8.3		<3.0		<1.0	
Pacific Mine Portal	10/21/1998 T	<2.0	240	24	87		13		<5.0	55	4.890	<0.2	18		31		<1.0	
NF American Fork bl Pacific Mine	10/21/1998 T	<2.0	40	<5.0	70		<1.0		<5.0	<12	0.143	<0.2	16		110		<1.0	
NF American Fork @ Dutchman	10/21/1998 T	<2.0	<30	<5.0	40		<1.0		<5.0	<12	0.060	<0.2	7.3		10		<1.0	

D = dissolved
T = total

NF American Fork ab Tibble Fork	10/21/1998	T	<2.0	<30	<5.0	40	<1.0	<5.0	<12	0.021	<0.2	<5.0	<3.0	<1.0
NF American Fork bl Tibble Fork	10/21/1998	T	<2.0	<30	<5.0	50	<1.0	<5.0	<12	0.050	<0.2	13	<3.0	<1.0

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MACROINVERTEBRATE ANALYSIS

Fred A. Magnum, Regional Aquatic Ecologist
Data Reformatted 01/19/00 By TVF

Station	Location	Organisms # per m2	DAT	SC g/m2	BCI 50	# Taxa	Zinc ug/l
1	Above Bog Mine	7,866	10.7	1	100	20	28
1	Above Bog Mine	8,981	10.2	0.9	93	21	< 20
3	Below Lower Bog Mine	5,193	12.2	0.6	82	25	77
3	Below Lower Bog Mine	1,922	1.5	0.1	79	21	190
3A	Above Pacific Mine	13,891	11.5	1.8	91	25	<20
3A	Above Pacific Mine	13,091	19.2	1.4	100	32	< 20
8	Below Pacific Mine	2,582	12.7	0.7	98	25	81
8	Below Pacific Mine	3,888	15.2	0.4	100	31	< 20
9	Dutchman Flat	8,730	8.3	0.8	88	23	43
9	Dutchman Flat	7,819	18.2	0.6	98	32	37
11	Below Mary Ellen	18,163	8.2	1.3	85	22	40
11	Below Mary Ellen	9,555	16.4	2.1	100	25	99
12	Above Mines @ MEG	12,424	11.6	2.1	88	25	< 20
12	Above Mines @ MEG	26,685	11.7	2.3	89	20	22
14	Below Mines @ MEG	30,110	1.2	2	79	17	110
14	Below Mines @ MEG	6,528	1.9	0.4	78	15	92
10	Mouth Mary Ellen	13,884	7.8	2.1	100	22	72
10	Mouth Mary Ellen	8013	15.2	1.4	100	25	41

	SCALE	*DAT*	*SC*	*BCI*
DAT - Diversity Index (mean)	Excellent	17 - 26	4.0 - 12.0	> 90
SC - Standing Crop	Good	10 - 17	1.6 - 4.0	80 - 90
BIC 50 - Biotic Condition Index	Fair	5 - 10	0.6 - 1.5	72 - 79
Zinc - 100 ppbillion =threshold for sensitive invertebrates	Poor	0 - 5	0.0 - 0.5	< 72

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Table 1
Mary Ellen Gulch Surface Water Laboratory Results
Samples collected 9/27/99
(Results in milligrams per liter, mg/L)

Number	Location		pH	Aluminum	Arsenic	Barium	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc
WS-1 [a]	Mary Ellen Gulch, below mines 100 yards below the lower	T[b]		0.08	<0.1	0.031	<0.005	<0.005	0.02	0.96	<0.07	0.05	<0.0002	<0.1	<0.005	0.24
	pond (before braiding).	D[c]	7.6	<0.04	<0.1	0.030	<0.005	<0.005	0.01	0.15	<0.07	0.05	<0.0002	<0.1	<0.005	0.15[d]
WS-2 [a]	Mary Ellen Gulch, lower pond.	T		<0.03	<0.1	0.15	<0.005	<0.005	<0.01	0.39	<0.07	0.01	<0.0002	<0.1	<0.005	0.14
		D	7.4	<0.04	<0.1	0.15	<0.005	<0.005	<0.01	0.11	<0.07	<0.01	<0.0002	<0.1	<0.005	0.11
WS-3	Mary Ellen Gulch (main stream), confluence of west tributary	T		0.14	<0.1	0.022	<0.005	<0.005	0.04	1.6	<0.07	0.07	<0.0002	<0.1	<0.005	0.37
	and the gulch.	D	7.5	0.07	<0.1	0.020	<0.005	<0.005	0.01	0.08	<0.07	0.07	<0.0002	<0.1	<0.005	0.21[d]
WS-4	Mary Ellen west tributary - just above the lower road.	T		0.11	<0.1	0.026	<0.005	<0.005	0.01	0.28	<0.07	0.02	<0.0002	<0.1	<0.005	0.19
		D	7.5	0.06	<0.1	0.025	<0.005	<0.005	<0.01	0.05	<0.07	0.02	<0.0002	<0.1	<0.005	0.14[d]
WS-5 [a]	Mary Ellen mine - north adit	T		0.10	<0.1	0.013	<0.005	<0.005	<0.01	5.8	<0.07	0.13	<0.0002	<0.1	<0.005	0.47
		D	6.6	0.04	<0.1	0.011	<0.005	<0.005	<0.01	2.2[d]	<0.07	0.12	<0.0002	<0.1	<0.005	0.41[d]
WS-6	Mary Ellen west tributary - before braiding 35' above 30" culvert	T		0.14	<0.1	0.023	<0.005	<0.005	0.01	0.02	<0.07	0.01	<0.0002	<0.1	<0.005	0.05
	(between upper & lower roads).	D	7.6	0.09	<0.1	0.024	<0.005	<0.005	<0.01	<0.02	<0.07	0.01	<0.0002	<0.1	<0.005	0.04
WS-7	Mary Ellen west tributary - just above the upper road to the	T		0.26	<0.1	0.024	<0.005	<0.005	0.03	0.04	<0.07	0.01	<0.0002	<0.1	<0.005	0.03
	Globe Mine.	D	7.6	0.09	<0.1	0.022	<0.005	<0.005	0.01	<0.02	<0.07	0.01	<0.0002	<0.1	<0.005	0.02
WS-8 [a]	Mary Ellen west tributary - 250' above the upper road	T		0.31	<0.1	0.022	<0.005	<0.005	0.03	0.06	<0.07	0.01	<0.0002	<0.1	<0.005	0.04
		D	7.5	0.09	<0.1	0.022	<0.005	<0.005	0.01	<0.02	<0.07	0.01	<0.0002	<0.1	<0.005	0.02
WS-9	Mary Ellen west tributary - just below upper iron bog wetland	T		1.7	<0.1	0.019	<0.005	<0.005	0.17	1.3	<0.07	0.06	<0.0002	<0.1	<0.005	0.17
	on the north tributary.	D	3.7	1.7[d]	0.1	0.020	<0.005	<0.005	0.17[d]	0.89	<0.07	0.06	<0.0002	<0.1	<0.005	0.18[d]
WS-10	Mary Ellen Gulch, upper pond.	T		0.07	<0.1	0.032	<0.005	<0.005	0.01	0.34	<0.07	0.02	<0.0002	<0.1	<0.005	0.03
		D	7.7	0.05	<0.1	0.030	<0.005	<0.005	<0.01	0.04	<0.07	<0.01	<0.0002	<0.1	<0.005	0.02
Utah Class 3A Cold-Water Aquatic Standard [e]			1-hr	0.75	0.36	NA[f]	0.0039	0.016	0.018	1	0.082	NA[f]	0.0024	0.02	0.0041	0.12

[a] Same sample location as USFS samples.
[b] T= Total concentration in water.
[c] D=Dissolved concentration in water.
[d] Figures exceed the specified standard.
[e] Class 3A Standards apply to dissolved metals concentrations only.
[f] NA=Not available.
Note: weather was clear, no known precipitation for the past several days.

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American Fork Canyon
Watershed Reclamation Project

COMMUNITY RELATIONS PLAN

Prepared By: TED V. FITZGERALD
On Scene Coordinator

Edited By: LOYAL CLARK
Public Affairs Specialist

Approved By: s/Peter W. Karp Date 3/28/00
PETER W. KARP
Forest Supervisor

American Fork Canyon
Watershed Reclamation Project

Community Relations Plan

OVERVIEW

The North Fork of American Fork River above Tibble Fork Reservoir has been tested for compliance with the Clean Water Act. The river was found to contain mineral contaminant concentrations at levels that could be hazardous to human health and welfare and damaging to the environment. Plans are being prepared for reclamation of the watershed to reduce the exposure of mineral rich mine waste piles to erosion and leaching resulting in contamination of the stream. The anticipated reclamation could affect some of the current uses the general public practices in the canyon. Some mine waste piles being used by recreational ATV riders will be restricted, evidence of historic mining could be obscured at some sites, and fish habitat in the stream will be improved as the water quality is restored.

Most of the community is unaware of the contamination of the North Fork of American Fork River from historic mining activities, and the increased contaminant levels resulting from some current recreational practices in the canyon. Those aware of the problems associated with the mining deposits, and mine drainage, in American Fork Canyon (AFC) include some Governmental agencies with Clean Water Act responsibilities, academia, and owners/operators of mines. The constant use of the mine tailings piles by ATV users during summer months keeps their surfaces unstable and highly susceptible to erosion. Environmental groups are becoming increasingly concerned with the effects of unrestricted motorized vehicle use on public and private lands. Organized ATV clubs are developing support for responsible riding to reduce impacts to natural resources in an attempt to educate their peers and perpetuate their preferred means of recreation . However, to date neither has addressed the contribution that motorized recreation at the mine sites plays in the contamination of American Fork River.

It is the intent of this plan to raise the awareness level of the community about the hazardous materials in the AFC environment, without creating unwarranted concern and alarm. It also presents procedures to be followed to gain local support for the necessary cleanup actions to bring AFC into compliance with State and Federal laws. The community relations program for watershed restoration efforts in upper AFC solicits the support and cooperation of Utah County officials and the Forest users, in particular, the ATV enthusiasts and anglers that frequent this area.

The Uinta National Forest has the lead responsibility for managing this reclamation effort and will oversee the community relation activities at the site. The plan provides for a series of public announcements, a web page containing pertinent information and schedules, public meetings or open houses, and a procedure to obtain public input.

SITE DESCRIPTION

Historic mining activity in upper American Fork Canyon (AFC) dates back to 1870 and the establishment of the American Fork Mining District. About 250 mining claims were surveyed in the American Fork Mining District in upper AFC. Mining activity peaked in the 1910's but active mining continued into the 1950's. Some mine owners are expressing renewed interest in their patented mining claims. Some National Forest System Lands in AFC were withdrawn from entry for mineral exploration and production in 1966 "for protection of the North Fork of the American Fork Canyon Watershed." *(Federal Register, Vol. 31, No. 142 – Saturday, July 23, 1966 and Vol. 31, No. 213 – Wednesday, November 2, 1966,.)* Nearly 40% of AFC above Mary Ellen Gulch went to patent and remains in private ownership. Mining could still be conducted on those lands and on unencumbered NFS Lands. Currently the principle use of both the pubic and private lands in AFC is for recreational purposes.

Recent mapping of mine sites in the Mary Ellen Gulch and upper AFC identified over 100 sites where mining activity was extensive enough to create mine adits (most of which have already been closed) and generate waste rock and tailings piles. The sites range in size from a few hundred square feet to 4 acres. At least four of the mines are releasing flows approaching 0.3 cubic feet per second (140 gallons/minute) of water laden with minerals including iron, copper, lead, cadmium, arsenic, and zinc into tributaries of American Fork River.

AFC is heavily used by recreationists. Over 1.2 million visitors in 340,000 vehicles passed through the entrance station to the canyon in 1999. The upper reaches of the canyon provide opportunities for hiking, equestrian use, touring, motorized recreation, wildlife viewing, fishing, camping, and a myriad of other outdoor activities. As Wasatch front populations continue to grow more demands are being placed on National Forest resources and visitation to the Forest is expected to increase proportionately.

Some of the public engaged in these activities come in contact with environmental conditions at abandoned mine sites and waste piles that may be hazardous to their health. Dust generated by ATV use on mine tailings contains airborne particles of lead and other hazardous minerals. Streams contain concentrations of minerals exceeding acceptable limits established by the State of Utah. The aquatic habitat is often not conducive to macroinvertebrate populations sufficient to sustain fish and other stream organisms. Bonneville Cutthroat trout (a sensitive species) and Brown trout have been sampled from the river below the mine sites and tested for contamination. Seven of twenty fish sampled were found to have absorbed lead or cadmium into their body tissues at concentration "levels considered hazardous to human health", if eaten. Extended exposure to these contaminants can lead to health problems in human beings.

Although laced with patented mining claims (private properties), management of the ecosystem in upper AFC falls primarily to the Pleasant Grove Ranger District of the Uinta National Forest. The District Ranger, working cooperatively with other Federal and State agencies, universities, private enterprises and other partners, will implement reclamation practices at selected mine sites in AFC to improve environmental conditions and water quality in American Fork River and its tributaries.

- INSERT Exhibit 1 – Site map

- INSERT Exhibit 2 – Project Location Map

COMMUNITY BACKGROUND

- Community Profile

Settlement of Utah Valley began almost immediately after the arrival of Mormon Pioneers in the mid 1800's. Land suitable for agriculture was plentiful and towns soon dotted the valley floor. Settlers journeyed into the mountains in search of timber for housing and commerce and forage for livestock. Mineral discoveries in mountain canyons occurred regularly. In 1870 the Miller brothers found rich ore deposits in upper AFC. That discovery lead to the establishment of the American Fork Mining District and the influx of hundreds of prospectors and miners to the area over the next decade. The District Headquarters was at the settlement of Forest City located at a site now known as Dutchman Flat adjacent to American Fork River at the mouth of Mary Ellen Gulch.

Mining was most active in AFC from 1903 to 1919 and 1925 to 1945. The peak ore production years were 1918 and 1932 with about 12,000 tons and 22,000 tons produced in those years. Nevertheless, the most lucrative period was reported to be between 1871 and 1876 when approximately $2,500,000 worth of gold, silver, and lead was extracted. That was more than double the value removed from the canyon during any other decade.

Construction of a narrow gage railroad started in 1871 with intentions of extending it up the canyon to Forest City. That goal was never reached, but it was reported that $1.7 million was spent by Miller Mining and Smelting Company on the railroad and a smelter at Forest City. In 1907, the roadbed was turned into a toll road and mining companies and other users paid a fee for the right to use the road. This was viewed as an injustice by the miners and the visiting public because the mining companies performed the bulk of the road upkeep. The toll was removed in 1909. The road remains in poor condition today. Four-wheel drive vehicles and ATV's are recommended to access this area.

Although very little mining activity is now occurring in the canyon, large blocks of patented lands remain in private ownership in the upper reaches of AFC. Some patented land has been reacquired by the United States and is now managed by the Forest Service. Several parcels of land have been acquired by Snowbird Ski Resort, or its owners.

Recreation is the predominate use of the canyon and it is expected to grow in popularity as growth continues in Utah Valley. Large numbers of recreationists congregate at the historic mine sites each summer. Some enjoy the experience of visiting the historic sites reflecting on a bygone lifestyle. Others utilize the mine waste piles for ATV and motorcycle riding at a pace similar to a motocross event. Regardless of their preferred recreational activity, the public is adamant about being able to continue recreating on Federal lands. Disputes between user groups are becoming more demonstrative as demands on the area increase.

Today there are several contiguous cities along the base of the mountains north and south of American Fork Canyon. Utah County is the local governmental agency which the Forest Service will collaborate with concerning mining reclamation in AFC. Contacts will be made with local communities and special interest groups based on their level of interest.

- Chronology of Community Involvement and Project Awareness

The Uinta National Forest has maintained good working relationships with local County and City representatives. In general these entities have found compatible, and often complimentary positions when dealing with controversial issues.

Prior to development of this Community Relations Plan there has been little contact with local governmental agencies concerning the water issues in American Fork River above Tibble Fork Reservoir. This plan identifies actions to involve local officials and alert the general public, including specific user groups, of the potential hazardous conditions now known to exist in upper AFC and planned clean-up actions.

Recognition of the extent of the problems in upper AFC evolved over time through the efforts of various individuals and agencies. The first official notification of the need to take action at the project site came in 1985 from Ben Albrechtsen, a Forest Service Regional employee. He summarized his field review of Pacific Mine with a recommendation to close the site to off-road vehicles and divert surface flows away from the tailings to prevent additional siltation of American Fork River. He outlined procedures to use in determining the level of contamination resulting from this site. The surface owner of the patent implemented some of the recommended actions but that work was soon made ineffective by continued ATV use at the site.

In 1988, Forest Service officials conducted water, soil, and macroinvertebrate sampling and testing. Those tests confirmed the presence of heavy metals in the tailings and periodic concentrations of lead and zinc in American Fork River and Mary Ellen Gulch which exceed Utah State clean water standards. Mine drainage was flowing from the closed adits at the Lower Bog Mine, Pacific Mine, and Yankee Mines. Macroinvertebrate sampling concluded that these effluents were having severe detrimental effects on their populations and diversity. It was recognized that this would impose a limiting affect on attempts to maintain a fresh water fishery in American Fork River within the reaches affected by mine contaminants.

As the Utah Division of Oil, Gas, and Mining officials worked in the canyon to close mine adits, they observed the conditions at various locations. After consultation with Utah Division of Environmental Response and Remediation officials in 1991, UDERR sent a "discovery form" to the Environmental Protection Agency. EPA listed American Fork Canyon as a "Comprehensive Environmental Response, Compensation, and Liability Inventoried Site" (CERCLIS) on January 24, 1992, based on data provided for the Lower Bog Mine, Pacific Mine, and the Mary Ellen Gulch mines (Yankee mines).

The Forest Service hired a consultant firm (Lidstone and Anderson) to do additional water samples in 1992 after the CERLIS listing. They confirmed the findings of 1988. The University of Wyoming was enlisted to study the benefits of having the mine drainage "filtered" by a wetlands at Pacific Mine. Nancy Culp, a graduate student, found the vegetative component in the wetlands did significantly reduce the levels of zinc and lead in the water. Subsequent graduate studies by two Utah State Masters Degree candidates have identified the specific plants that are most effective in reducing heavy metals in streams.

The Uinta National Forest completed a ***Preliminary Assessment*** of the project site in June 1994. Copies of the report were distributed to the agencies involved, specifically EPA. Additional soil samples were collected that year at the three mine sites. Budgets and personnel were not sufficient at the Forest level for more definitive actions until Bob Gecy was hired as the Forest Hydrologist in November 1996. When Mr. Gecy learned of this project, he submitted budget requests for funding to provide for sufficient data to complete ***Site Investigations*** (a CERCLA requirement) at the various mine sites. Some funds came to the Forest in 1998 and 1999 which allowed more samples to be obtained at the three mine sites. As further evaluation of the area progressed, it was considered that the contamination of natural resources may be compounded by other mine sites along the river and even further up on Miller Hill.

This project was rapidly growing in scope and complexity. The Regional Forester and Forest Supervisor agreed to bring in a full time On-Scene Coordinator to expedite and direct the work. Ted Fitzgerald was reassigned as a Regional Office Employee stationed at the Uinta National Forest to assume those responsibilities. He has prepared a program of work, tailored to meet CERCLA standards, that will result in reclamation efforts being completed at the various mine sites by the end of 2002. Monitoring of the sites and streams will continue for a few years thereafter to determine the success of the reclamation efforts. Mr. Fitzgerald will oversee the program of work through completion of reclamation.

- Key Community Concerns

Currently community concerns about the contamination of waters in upper AFC is nearly nonexistent. Very few people are aware that a problem even exists. The public does not recognize the historic mining sites as contributing to a potential public health hazard. The bulk of the mining activity occurred before most of the current population was born and there are no known reports of people having suffered adverse health conditions tied to their use of AFC.

As the Community Relations Plan is implemented, the public will become informed of the level of contamination in upper AFC. There may be individuals and organizations that will become more interested and involved as they learn of this situation. As cleanup efforts are implemented at the various mines, additional concerns may surface due to the impact those actions will have on some of the current recreational activities.

The popularity of this area has been enhanced by the abandoned mine sites. The mines provide a focal point for people to congregate. Many people enjoy exploring these sites and reflecting on the way the pioneers of this area lived. Others have found opportunity to camp and picnic at some of the mines because they offer open, relatively flat areas where vehicles and trailers can pull of the road far enough to be free of the dust and noise of other travelers. Some mine sites are very popular riding areas for ATV enthusiasts. These areas provide a riding experience unlike that found on roads and trails; an experience more challenging and thrilling which, for many riders, is becoming more highly valued in light of continually diminishing opportunities.

As reclamation activities occur many of the mine sites will lose the characteristics which attract visitors to those locations. In some cases the evidence of the mining activity may, for the most part, be obliterated as the tailings piles are removed or covered. The areas will be closed to public use as vegetation is reintroduced to the sites and becomes established. ATV use of the areas will probably be prohibited except on specified roads and trails. (*That has been the prescription for motorized use of this area under the Forest Travel Plan for several years. As this area undergoes reclamation, the travel restrictions will be more aggressively enforced to protect the large capital investments represented by the reclamation.*)

There are individuals and groups that may object to what they perceive as an attempt to impose even further restrictions on their use of Federal lands resulting from the cleanup efforts that will occur in AFC. Conflicts between user groups may be aggravated as ATV use is diverted off the mine sites and concentrated more on roads and trails designated "open" to ATV use. Projection of ATV use in the canyon, after completion of this project, is that it will continue to grow in popularity even though there will be fewer places for people to ride. This scenario presents land managers with a potential dilemma because some people are already complaining to the Forest Service about ATV use in the canyon. Developing a responsible rider ethic among all ATV users, coupled with law enforcement, may be the only way to prevent greater restrictions.

HIGHLIGHTS OF THE PLAN

The community relations program for upper American Fork Canyon is intended to allow Forest users and adjacent communities to learn about and participate in the cleanup effort, without unduly alarming the community about present potential hazards. To be effective, the community relations program must present the project in the light of "a real need to take action" for the benefit of the environment and Forest users, recognizing the impacts it will impose on certain recreational and historic values.

The community relations program provides the following approaches:

1. Enlist the support and participation of local officials in coordinating community relations activities. Appropriate officials to involve in the community relations program include the Utah County Commissioners; Mayors and City Councils of American Fork, Lehi, Alpine, Pleasant Grove, Lindon, Orem, and Provo; and District Health Department officials. To enlist the support of these officials an orientation meeting will be requested by the Forest Service with the Utah Valley Council of Governments and health departments. Regular updates of community reaction and progress with the project will follow.

2. Contact Federal and State Elected Officials. Send letters outlining the project and offer to meet with Congressional representatives at both the Federal and State levels. The letters need to reach these officials at the same time County and Local officials are notified. This will be done prior to providing information to the general public.

3. Advise the general public of the project. Media releases will present factual information about the conditions that exist in upper AFC and the timeframe in which cleanup actions will occur. These releases will be designed to emphasize the seriousness of the situation and the potential impacts to current practices in the canyon. They will identify ways in which the public can provide input to the project.

4. Contact Special Interest Organizations. Send letters outlining the project to organized groups that have shown interest in Forest Service actions or requested they be informed of new projects or proposals. Provide them with the opportunity to comment on the project or otherwise become engaged.

5. Install Information Signs at the Project Location. Signs alerting the public of the situation in AFC will be installed up canyon from Tibble Fork Reservoir at a turnout in the road. Other signs will be placed at key locations in the canyon adjacent to sites subject to reclamation in the future.

6. Let the people "set the pace" for the community relations program. After the initial announcement of this project to governmental officials and the public, the forest Service will monitor the reaction and response to the project. Determine the need for additional contact, either by the Forest Service or by other local officials. Determine if public meetings are warranted. Do not be overly aggressive in trying to generate interest in this project. Provide the public the opportunity to get involved and respond according to their level of interest.

TECHNIQUES AND TIMING

- Upon approval of the Community Relations Plan by the Forest Supervisor prepare letters to local, State, and federal leaders. Arrange a time to meet with the County Commissioners at their regularly scheduled commission meeting or at a Utah Valley Council of Governments meeting. (*These actions should be completed in March 2000.)*

- After meeting with the County Commission arrange a meeting with the District Health Department and present them with a package of information detailing the level of contamination known to exist in the tailings and waters in upper AFC. Request their assistance in identifying means of treating the sites, inform them of the proposed timetable for the project and planned "Time Critical Removal Actions", and invite their involvement in the project. (*This should be done in March 2000.)*

- Prepare media releases and letters to organized groups alerting the public to the project. Send out those messages after consulting with the District Health Department. Identify a contact point and person for responses from the public. (*Schedule this action for late March or early April 2000.)*

- Establish and maintain information repositories. Fact sheets, technical summaries, site reports (including the community relations plan), and information on the CERCLA process for reclamation projects will be placed in the information repositories. Paper copies of the information will be located at the Pleasant Grove Ranger District Office and the Forest Supervisor's office in Provo. The information will also be available on an Internet site accessible to the public via computer. *(This data will be available in mid April 2000 and will be updated as new information becomes available.)*

- Purchase interpretive signs explaining the need for the project, the environmental conditions associated with the mine sites and streams, and the plans to perform reclamation at various sites in the canyon. Identify the Forest Service contact for public comment. *(Install those signs as soon as reasonable access to the canyon develops in the spring of 2000.)*

- Monitor the progress of the project and provide officials with regular updates and progress reports. Keep the lines of communication open to all who desire to be informed of the project and specifically with County officials. *(Implement as warranted.)*

ADDITIONAL INFORMATION AND PUBLIC RESPONSE

Additional information about this project can be obtained from the following Forest Service sources. Public response to the project is welcomed.

- Ted V. Fitzgerald, On-Scene Coordinator
  Uinta National Forest Supervisor's Office
  88 West 100 North
  Provo, Utah 84601
  Phone 801 342-5171
  Email: afcproject@fs.fed.us

- Bob Easton, District Ranger
  Pleasant Grove Ranger district
  390 North 100 East
  Pleasant Grove, Utah 84062
  Phone 801 342-5241

Information repositories for this project are open for public review at the addresses above or that information can be viewed On-Line at Internet address www.fs.fed.us/r4/uinta in the "AFC Watershed Reclamation Project" link.

ATTACHMENT

LIST OF CONTACTS AND INTERESTED PARTIES

A. Federal Elected Officials

(names, titles, and addresses) (phone)

B. State Elected Officials

(names, titles, and addresses) (phone)

C. Local Elected and Appointed Officials

(names, titles, and addresses) (phone)

D. Forest Service Officials

(names, titles, and addresses) (phone)

E. State and Local Agencies

(names, titles, and addresses) (phone)

F. Community Organizations, Environmental Groups, and Citizens Groups*

(names and addresses) (phone)

G. Media Contacts

(names and addresses) (phone)

* Names and addresses of private citizens should not appear in the community relations plan that is released to the public. These names should, however, be placed on a mailing list that is compiled for the project. To protect the privacy of individuals, this mailing list is compiled for the sole use of the lead agency – Forest Service.

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Phase II Assessment Report
Miller Hill Property
American Fork Canyon, Utah

KWBrown

Scientists • Engineers • Planners

KW Brown & Associates, Inc.
570 East Research Park Way, Suite 108
North Logan, Utah 84341
Fax: 435-787-1495
www.kwbes.com

Scott Evans
Senior Project Manager
435-787-1490
sevans@kwbes.com

December 20, 1999
Project No. 159807

Mr. Robert Pruitt III
Pruitt, Gushee & Bachtell
Beneficial Life Tower, Suite 1850
Salt Lake City, Utah 84111-1495

Re: Phase II Assessment Report
Miller Hill Property
American Fork Canyon, Utah

Dear Mr. Pruitt:

KW Brown & Associates, Inc. (KW Brown) is pleased to present Pruitt, Gushee & Bachtell with this report of our Phase II site assessment conducted at the above-referenced site (Figure 1, Site Location Map). The assessment consisted of a surface water and surface soil sample collection and laboratory analysis program.

BACKGROUND

KW Brown completed a Phase I Environmental Site Assessment of the property for Pruitt, Gushee & Bachtell on August 12, 1999. That report identified potential environmental concerns both on and off the subject site, as follows:

- The mine adit and tailings pile on the Scotchman 4 claim and the tailings pile located on the Scotchman claim are potential sources of contamination for the American Fork Creek. Additionally, the tailings pile on the Scotchman 4 claim represents a potential human health concern to recreational users, either through inhaled dust or direct contact.

- The adit and tailings pile at the upgradient Pacific Mine are potential sources of contamination for the American Fork Creek, which flows through the subject site.

The purpose of the Phase II site assessment was to evaluate potential impacts to the American Fork Creek and recreational users from the above sources.

SURFACE WATER SAMPLING AND ANALYSIS

On September 28, 1999, KW Brown collected surface water samples at the site. Samples were collected from downstream to upstream, to minimize disturbance of the stream and potential cross-contamination. Samples were collected in one-liter plastic bottles, stored in a cooler with ice, and delivered within 24 hours under chain-of-custody protocol to ChemTech-Ford, Inc., a state-certified laboratory located in Salt Lake City, Utah. Samples to be analyzed for total metals were preserved in the field with nitric acid; those to be analyzed for dissolved metals were filtered at the laboratory. The specific metals analyzed were selected to match those chosen by the United States Forest Service (USFS), in order to better correlate the data sets. The metals analyzed were aluminum, arsenic, barium, cadmium, chromium (total), copper, iron, lead, manganese, mercury, selenium, silver, and zinc.

The surface water sampling locations were selected to 1) match the recommendations in the Phase I report; 2) to duplicate locations sampled by the USFS, where possible; and 3) to evaluate possible impacts to the stream from various sources. The sampling locations are described in Table 1 and shown on Figure 2.

A summary of the surface water laboratory results is presented in Table 1. The complete laboratory report is included in Appendix A.

MINE TAILINGS SAMPLING AND ANALYSIS

On September 28, 1999, KW Brown collected samples from the Scotchman 4 tailings pile at the site. Two of the samples (SS-1 and SS-2) were collected from the road on the tailings pile. The third sample (SS-3) was collected from the relocated pile at the north end of the Scotchman 4 pile. The sampling locations are described in Table 2 and shown on Figure 3. The samples were collected using a shovel that had been precleaned with non-phosphate detergent and water. The samples were placed in precleaned eight-ounce glass jars and delivered within 24 hours under chain-of-custody protocol to ChemTech-Ford, Inc. The samples were analyzed for total concentrations of the same metals as the surface water samples.

A summary of the mine tailings laboratory results is presented in Table 2. The complete laboratory report is included in Appendix A.

CONCURRENT FIELD WORK

At the request of the USFS, the United States Geological Survey (USGS) conducted a tracer study along the American Fork Creek during the last week of September and the first week of October, 1999. The purpose of the study was to evaluate metals loading in the watershed from 54 discrete segments of the creek.

The USGS has not yet evaluated the data collected during the tracer study, and does not anticipate analyzing the data until the year 2000. The report is due to the USFS in June 2000. KW Brown spoke with Briant Kimball of the USGS, who took part in the study. Mr. Kimball stated

that he observed no fish in the streams, except in the beaver ponds, but that he did observe mayflies, which are intolerant of elevated levels of metals in the water.

FINDINGS

Surface Water

According to Utah Administrative Code Rule R317-2, the waters of American Fork Creek are protected for 1) secondary contact recreation such as boating or wading (Class 2B); 2) cold water species of game fish and other cold water aquatic life (Class 3A); and 3) agricultural uses (Class 4). Of those three protected classes, the Class 3A standards are the most restrictive. Based on a conversation with the Utah Department of Environmental Quality (DEQ), the one-hour (acute) Class 3A Standards are appropriate to apply to grab samples. Therefore, the one-hour Class 3A standards have been supplied in Table 1 for purposes of comparison. Please note that those standards apply only to dissolved concentrations of metals.

Of the water samples collected, only one exceeded the Class 3A standards: the discharge from the Pacific Mine adit (WS-7). However, the impact of the discharge on the American Fork Creek has been ameliorated by the time the creek is 100 feet below the Pacific Mine tailings pile (sample WS-6), and that water meets the Class 3A standards.

In August and October 1998, the USFS collected water quality data from three of the same locations as KW Brown. As shown in Table 3, the September 1999 data correlates well with either the August or October 1998 USFS data, or, in some cases, with both data sets. The differences between the 1998 and 1999 data sets (as well as within the 1998 data set) appear to be related to seasonal variations in stream flow and precipitation, and do not indicate marked changes from one year to the next.

Mine Tailings

Based on conversations with the Utah DEQ, the DEQ uses screening numbers to assess whether concentrations of chemicals found at a site require further action and/or notification of the DEQ. For soil, the DEQ has adopted the United States Environmental Protection Agency (EPA) Region 3 Risk-Based Concentrations (RBCs). These screening values are presented at the bottom of Table 2 for purposes of comparison.

The concentrations of arsenic in all three samples exceed both the residential and industrial RBCs. The concentration of lead in one of the three samples exceeds the screening level for lead.

CONCLUSIONS AND RECOMMENDATIONS

Concentrations of dissolved metals in the segments of the American Fork Creek that pass through the subject property did not exceed Class 3A water quality standards on the day of KW Brown's sampling.

Concentrations of arsenic and lead in the tailings pile on the Scotchman 4 claim exceed risk-based concentrations adopted by the DEQ. The primary concern with these metals concentrations is that dust from the pile will become entrained in the air as vehicles are driven on the pile and then either inhaled or ingested by the recreational users. In order to protect human health, KW Brown recommends that the tailings pile either be secured to prevent public access that might produce dust, or that it be covered with topsoil and vegetated to prevent the tailings from becoming airborne.

If construction activities are planned for the tailings piles at the Miller Hill property, KW Brown recommends that best management practices be followed to prevent sedimentation of the American Fork Creek and to prevent construction workers from ingesting or inhaling dust.

In addition, KW Brown recommends that a copy of the tracer study be obtained from the USFS once it is available to the public. The report should be reviewed for possible implications for the Miller Hill property.

It has been a pleasure working with you on this assignment. If you have any questions or require further clarification regarding this letter report, please contact our office.

Sincerely,

Alison Canning Davies
Senior Geologist

Scott Evans
Senior Project Manager

Attachments: Tables 1, 2 and 3
Figures 1, 2 and 3
Appendix A

Table 1
Miller Hill Surface Water Laboratory Results
Samples collected 9/28/99
(Results in milligrams per liter, mg/L)

Number	Location		pH	Aluminum	Arsenic	Barium	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc
WS-1	Scotchman 4 adit - water from pipe.	T[a]		<0.03	<0.1	0.032	<0.005	<0.005	<0.01	<0.02	<0.07	<0.01	<0.0002	<0.1	<0.005	<0.01
		D[b]	7.4	<0.03	<0.1	0.034	<0.005	<0.005	<0.01	<0.02	<0.07	<0.01	<0.0002	<0.1	<0.005	<0.01
WS-2	Below Scotchman 4 tailings pile, below	T		0.03	<0.1	0.048	<0.005	<0.005	<0.01	0.11	<0.07	0.02	<0.0002	<0.1	<0.005	0.08
	where adit flow would enter stream.	D	7.4	<0.03	<0.1	0.045	<0.005	<0.005	<0.01	0.05	<0.07	0.01	<0.0002	<0.1	<0.005	0.06
WS-3	Above Scotchman 4 tailings pile, before	T		<0.03	<0.1	0.048	<0.005	<0.005	<0.01	0.15	<0.07	0.02	<0.0002	<0.1	<0.005	0.08
	stream braiding.	D	7.7	<0.03	<0.1	0.047	<0.005	<0.005	<0.01	0.06	<0.07	0.02	<0.0002	<0.1	<0.005	0.07
WS-4	Below Scotchman claim, below braiding	T		<0.03	<0.1	0.054	<0.005	<0.005	<0.01	0.24	0.10	0.03	<0.0002	<0.1	<0.005	0.10
	braiding (100' below tailings).	D	7.7	<0.03	<0.1	0.047	<0.005	<0.005	<0.01	0.06	<0.07	0.02	<0.0002	<0.1	<0.005	0.07
WS-5	Above Scotchman claim, 80' upstream	T		<0.03	<0.1	0.050	<0.005	<0.005	<0.01	0.16	<0.07	0.02	<0.0002	<0.1	<0.005	0.09
	above tailings pile.	D	7.7	<0.03	<0.1	0.050	<0.005	<0.005	<0.01	0.07	<0.07	0.02	<0.0002	<0.1	<0.005	0.08
WS-6[c]	Below Pacific Mine tailings, 100' below	T		0.03	<0.1	0.049	<0.005	<0.005	<0.01	0.19	<0.07	0.02	<0.0002	<0.1	<0.005	0.09
	tailings pile (below spring discharge point).	D	7.7	<0.03	<0.1	0.045	<0.005	<0.005	<0.01	0.06	<0.07	0.02	<0.0002	<0.1	<0.005	0.07
WS-7[c]	Pacific Mine adit discharge.	T		0.18	<0.1	0.095	0.014	<0.005	0.05	3.5	<0.07	0.01	<0.0002	<0.1	<0.005	2.0
		D	6.8	<0.04	<0.1	0.091	**0.012**[d]	<0.005	<0.01	0.18	<0.07	0.01	<0.0002	<0.1	<0.005	**1.7**[d]
WS-8[c]	One quarter mile above Pacific Mine, 1/2	T		0.03	<0.1	0.056	<0.005	<0.005	<0.01	0.16	<0.07	0.03	<0.0002	<0.1	<0.005	0.02
	way between the mine and road crossing.	D	7.6	<0.04	<0.1	0.055	<0.005	<0.005	<0.01	0.05	<0.07	0.01	<0.0002	<0.1	<0.005	0.01
Utah Class 3A Cold-Water Aquatic Standard[e]			1-hr	0.75	0.36	NA[f]	0.0039	0.016	0.018	1	0.082	NA[f]	0.0024	0.02	0.0041	0.12

[a] T= Total concentration in water.
[b] D=Dissolved concentration in water.
[c] Same sample location as USFS samples.
[d] Figures exceed the specified standard.
[e] Class 3A Standards apply to dissolved metals concentrations only.
[f] NA=Not available.
Note: weather was clear, no known precipitation for the past several days.

Table 2
Miller Hill Mine Tailings Laboratory Results
Samples collected 9/28/99
(Results in milligrams per kilogram, mg/kg)

Number	Location	Aluminum	Arsenic	Barium	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc
SS-1	Top of tailings pile in road (Scotchman 4).	480	**22[a]**	170	0.6	1.1	5	960	320	16	0.50	<10	<0 5	100
SS-2	Mid-tailings pile in road (Scotchman 4).	690	**32[a]**	220	<0.5	1.3	7	2,000	**450[a]**	6	0.82	<10	<0 5	57
SS-3	Relocated pile north end of Scotchman 4.	550	**70[a]**	250	<0.5	1.0	5	1,300	120	4	0.48	<10	<0 5	29
USEPA Region 3 residential risk-based concentration (RBC)		78,000	0.43	5,500	39	230	3,100	23,000	400	1,600	7.8	390	390	23,000
USEPA Region 3 industrial risk-based concentration (RBC)		2,000,000	3 8	140,000	1,000	6,100	82,000	610,000	NA	41,000	200	10,000	10,000	610,000

[a] Figures exceed the specified standard.

[b] NA=Not available.

Table 3

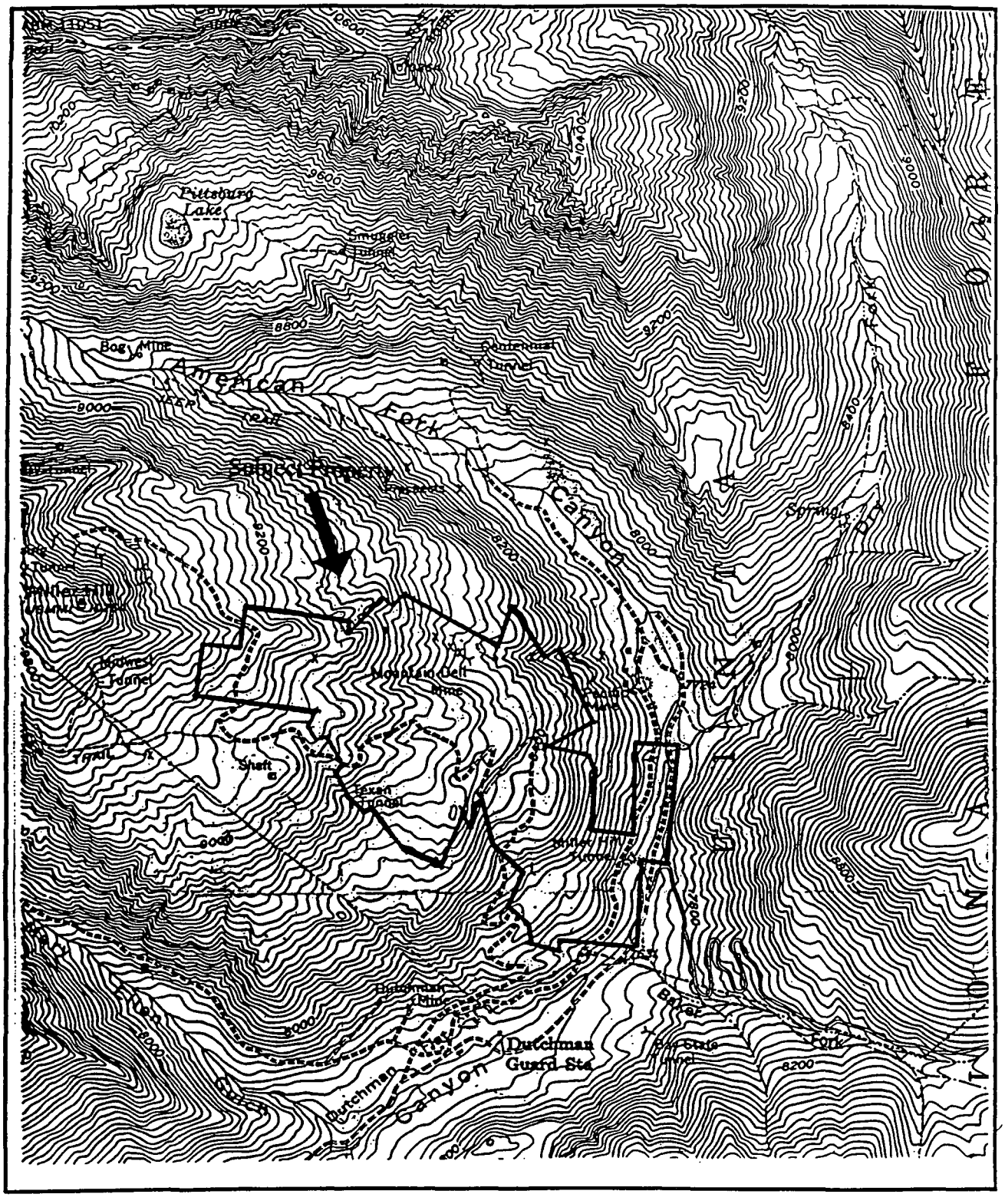
Miller Hill Comparison of Surface Water Data

Samples collected by KW Brown (1999) and the USFS (1998)

(Results in milligrams per liter, mg/L)

Number	Date	Location			Aluminum	Arsenic	Barium	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc
WS-6	9/28/99	Below Pacific Mine tailings, 100' below	KWB	T*	0.03	<0.1	0.049	<0.005	<0.005	<0.01	0.19	<0.07	0.02	<0.0002	<0.1	<0.005	0.09
	8/26/98	NFAF below Pacific Mine	USFS	T	0.057	<0.005	0.047	<0.001	<0.005	<0.012	1.96	0.016	0.019	<0.0002	<0.001	<0.002	0.1
	10/21/98	NF American Fork below Pacific Mine	USFS	T	0.04	<0.005	0.070	<0.001	<0.005	<0.012	0.143	0.11	0.016	<0.0002	<0.001	<0.002	0.069
WS-7	9/28/99	Pacific Mine adit discharge.	KWB	T	0.18	<0.1	0.095	0.014	<0.005	0.05	3.5	<0.07	0.01	<0.0002	<0.1	<0.005	2.0
	10/21/98	Pacific Mine Portal	USFS	T	0.24	0.024	0.087	0.013	<0.005	0.055	4.89	0.031	0.018	<0.0002	<0.001	<0.002	1.6
WS-8	9/28/99	One quarter mile above Pacific Mine, 1/2	KWB	T	0.03	<0.1	0.056	<0.005	<0.005	<0.01	0.16	<0.07	0.03	<0.0002	<0.1	<0.005	0.02
	8/26/98	NFAF above Pacific Mine	USFS	T	0.095	<0.005	0.046	<0.001	<0.005	<0.012	2.120	<0.003	0.022	<0.0002	<0.001	<0.002	0.040
	10/21/98	NF American Fork above Pacific Mine	USFS	T	0.031	<0.005	0.039	<0.001	<0.005	<0.012	0.076	<0.003	0.0083	<0.0002	<0.001	<0.002	0.030

*T= Total concentration in water.



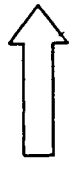


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Figure 1. Site Location Map – USGS Brighton, Utah Quad, 1955

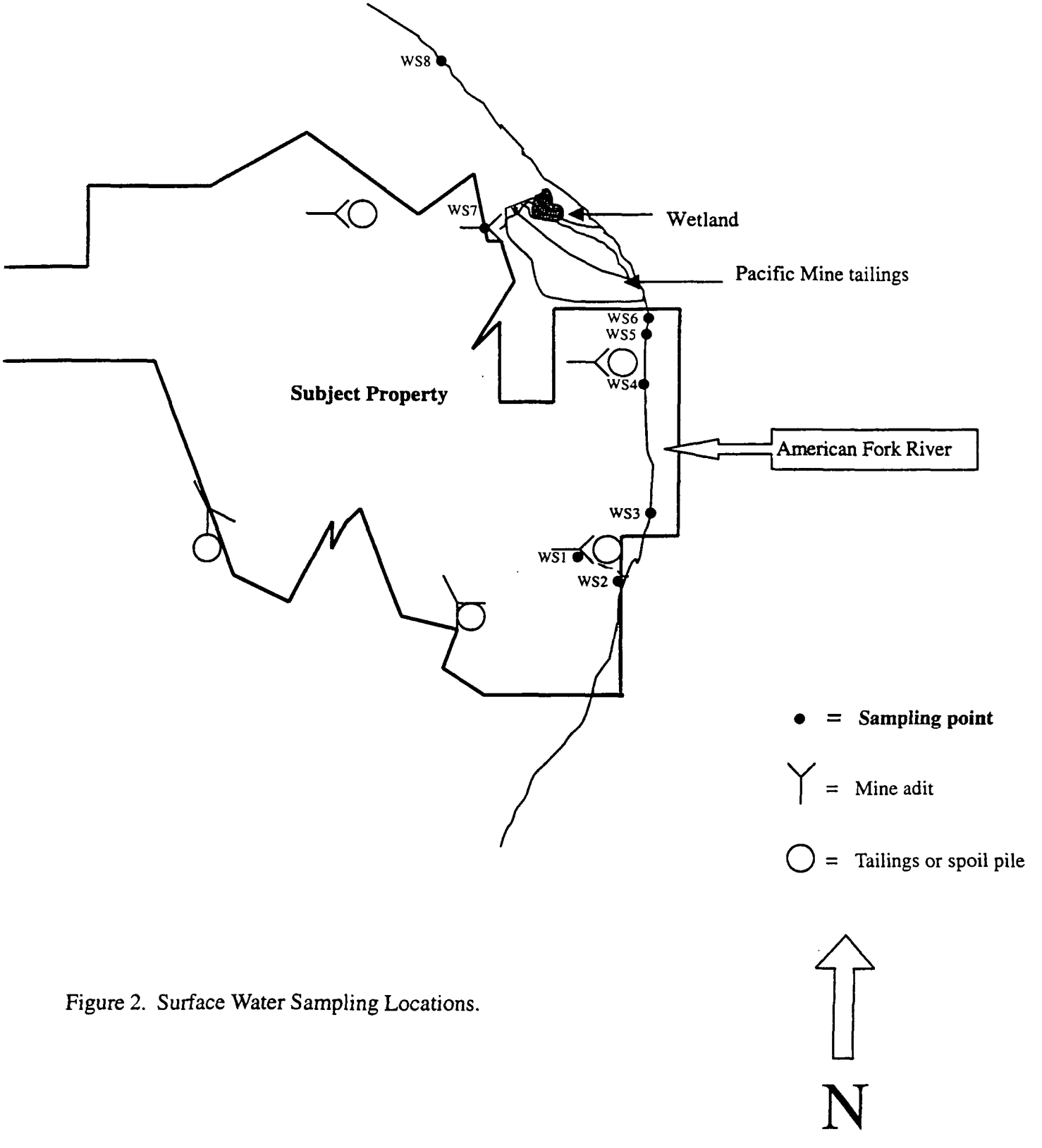

Figure 2. Surface Water Sampling Locations.

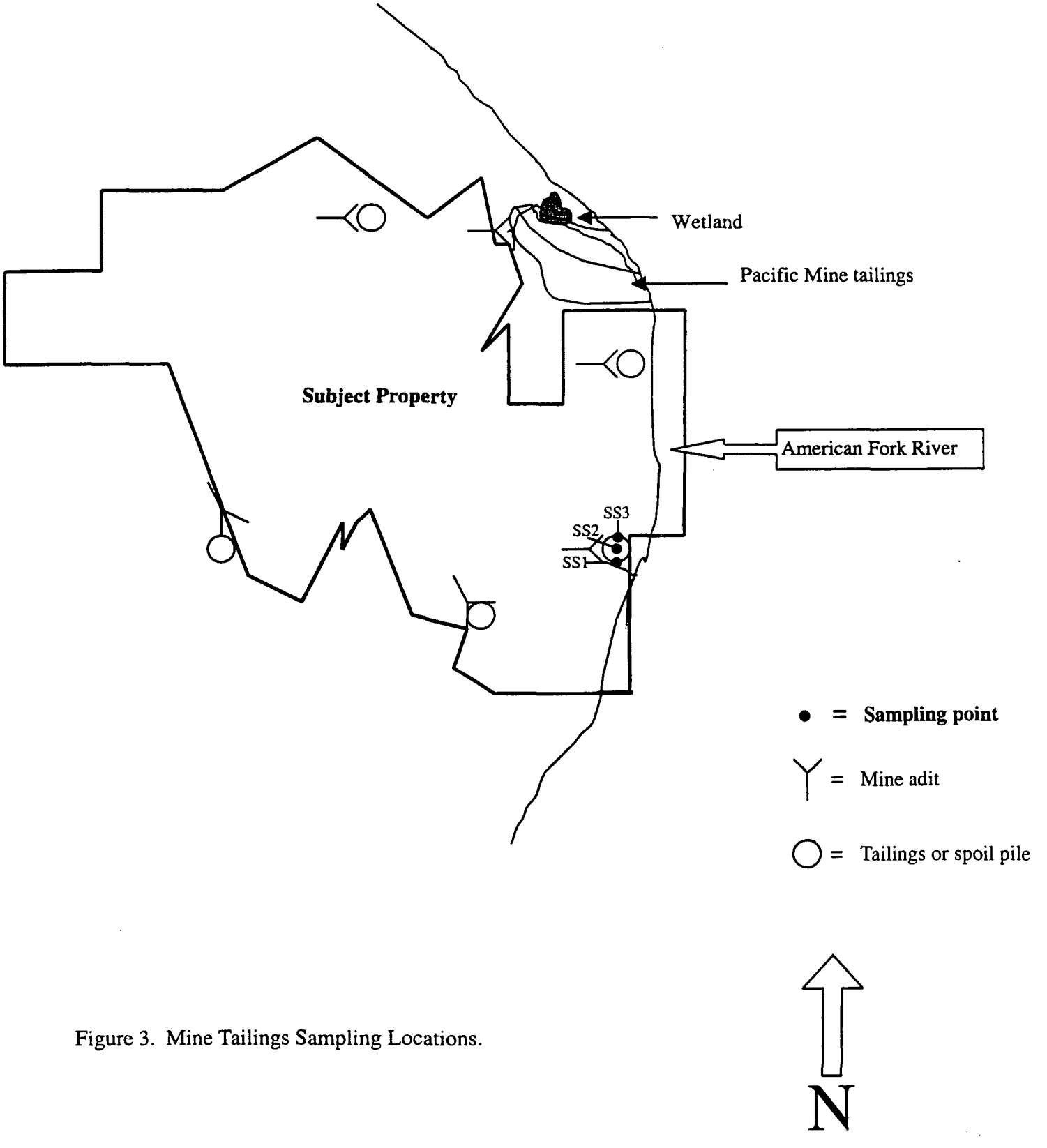

Figure 3. Mine Tailings Sampling Locations.

TARGET SHEET

EPA REGION VIII

SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOCUMENT NUMBER: 1003546

SITE NAME: AMERICAN FORK CANYON

DOCUMENT DATE: 10/19/2001

DOCUMENT NOT SCANNED

Due to one of the following reasons:

- ☐ PHOTOGRAPHS
- ☐ 3-DIMENSIONAL
- ☐ OVERSIZED
- ☐ AUDIO/VISUAL
- ☐ PERMANENTLY BOUND DOCUMENTS
- ☐ POOR LEGIBILITY
- ☐ OTHER
- ☐ NOT AVAILABLE
- ☑ TYPES OF DOCUMENTS NOT TO BE SCANNED
  (Data Packages, Data Validation, Sampling Data, CBI, Chain of Custody)

DOCUMENT DESCRIPTION:

APPENDIX A Laboratory Report

Contact the Superfund Records Center to view available document
(303) 312-6473

TABBED PAGE
K

Pacific Mine (American Fork Canyon)
Preliminary Assessment

PRELIMINARY ASSESSMENT

AMERICAN FORK CANYON

PACIFIC MINE
MARY ELLEN GULCH MINE
LOWER BOG MINE

UINTA NATIONAL FOREST

PLEASANT GROVE RANGER DISTRICT

June 1994

PRELIMINARY ASSESSMENT

UPPER AMERICAN FORK CANYON

UINTA NATIONAL FOREST
PLEASANT GROVE RANGER DISTRICT

PACIFIC MINE, LOWER BOG MINE, AND MARY ELLEN GULCH MINE

PREPARED BY: _____

REVIEWED AND RECOMMENDED BY:

DISTRICT RANGER _____

RESOURCE ASSISTANT _____

EXECUTIVE SUMMARY

PACIFIC, LOWER BOG, AND MARY ELLEN MINES
AMERICAN FORK CANYON, UTAH

The Pacific, Lower Bog, and Mary Ellen mines are located on National Forest System lands on the Uinta National Forest. Each mine has associated tailings piles with ground water running out of the mine adits. This water has been tested periodically, and is known to contain elevated levels of copper, zinc, and cadmium.

The area near the Pacific mine is used by recreationists. OHV (Off Road Vehicle) use occurs on the tailings pile of the Pacific mine. The Lower Bog and Mary Ellen mines are less accessible to publics; however water from these adits still enter the North Fork of American Fork creek.

The Uinta National Forest recommends mitigation and reclamation to varying degrees at each site. This Preliminary Assessment makes no effort to recommend specific techniques. Rather, the P.A. is written to give the reader an overview of the situation at each site along with a brief history, ownership, and condition of sites.

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General Site Information

- Site Name and Location
- Type of Facility
- Type of Ownership
- Site Status
- Years of Operation
- Owner/Cperator Information
- Environmental Setting
- Site Size

Source and Waste Characteristics

- Source Types and Locations
- Hazardous Substances Present
- Ground Water Use and Characteristics
- Surface Water use and Characteristics
  - Surface Water Body Types Within 15 Downstream Miles
  - Fisheries Within 15 Downstream Miles
  - Sensitive Environments and Wetlands Within 15 Downstream Miles
  - Acreage of Wetlands within Four Miles
- Soil Exposure Characteristics
- Air Pathway Caracteristics

PART II

Preliminary Assessment Scoresheet

PART III

Correspondence

PART IV

Sample Results From Water, Soil, and Tailings at the Three Sites

Appendix A

"American Fork Hydrology and Water Quality Study"
Lidstone and Anderson, Inc, February 3, 1993

Appendix B

"Aquatic Ecosystem Inventory", Macroinvertebrate Analysis

PART I

General Site Information
and
Source and Waste Characteristics

photo circa 1910
pacific mine

GENERAL SITE INFORMATION

CERCLIS ID NUMBER:

UTD 988074951

SITE NAME AND LOCATION:

The site has been identified and will be referred to as the American Fork Mining District Site which is composed of three separate locations which are in close proximity to each other. These sites include the: Mary Ellen Gulch mine and tailings (MEG), Lower Bog mine and tailings (LB), and Pacific mine and tailings (PM). General location is in Utah County, in the Upper American Fork Canyon area. The MEG mine is located in Township 3 South, Range 3 East, NW1/4 of SE1/4 Section 20. The Lower Bog Mine is in Township 3 South, Range 3 East, SW1/4 of SE1/4 Section 16. The Pacific Mine and Tailings are located at Township 3 South, Range 3 East, NW1/4 of SE1/4 Section 22. All legal descriptions are Salt Lake Based Meridian (SLBM).

Ground water is present in all three mines. The water is exposed to mineralized rock, spent ore, and or tailings changing the chemical composition of the water (Lidstone & Anderson, Inc 1993). In the case of the three mines, the water runs out of the adit across tailings piles and into the American Fork River. In addition to containing trace elements picked up in the mine shafts, except at the Lower Bog Mine, the water picks up more contaminants as it passes through the tailings piles. Precipitation events also contribute to the pollution of the American Fork River through surface run-off from the tailings. In both the Pacific and Lower Bog situations, tailings piles at both sites are within 10 feet of the North Fork of American Fork river. This close proximity to surface water allows a high potential for contamination to occur to the river during and after most precipitation events.

The area surrounding the three sites is used throughout much of the year by outdoor enthusiests. Recreational opportunities exist throughout the area including camping, fishing, hunting, off road vehicle use, and exploring. The ability for people get close to and travel virtually unrestricted through old mining operations appeals to many people. The area has a rich mining history that attracts people to it. Unfortunately, people who visit these sites are exposing themselves to more than just the appeal of the area.

Public access to the effluent and tailing piles is generally unrestricted particularly at the Pacific mine. Efforts were made to fence the area but were unsuccessful in restricting all publics from being exposed to the area. The tailings pile at the Pacific Mine is used by Off Highway Vehicles (OHV) as a hill climb and OHV play area.

The Lower Bog mine is less accessible, requiring a short hike or four wheel drive to get close enough to make the 200 yard hike to the foot of the tailings pile. The Mary Ellen Gulch mine is on private land and vehicle access requires travel with high clearance vehicles.

Exposure to the sites has not been directly linked to any health problems however that possibility exists.

TYPE OF FACILITY:

The three sites are facilities associated with early 20th century hard rock mining claims. Silver, Iron ore, and gold were all mined at these sites (Keech). Along with the mining activities, milling also occurred on site,leaving tailing piles at the Pacific and Lower Bog mines (See Attached Photos). Ground water is flowing out of each of the three mine adits at varying flow rates. The ground water is exposed to elevated levels of Zinc, Cadmium, Copper, and Lead (See Appendix A). In addition to the contamination that occurs within the adit, in the case of the Pacific and Mary Ellen mines, the same effluence flows over mine tailings with similar elevated elements.

TYPE OF OWNERSHIP:

MARY ELLEN GULCH MINE: (Survey Number L57, Plat Index Number 392) Sold by Mann Enterprises to William D. Schnack on 8/20/1987. This mine is privately owned and currently not in operation. The water that flows out of the mine adit flows across mine tailings directly into the Mary Ellen Gulch tributary of the American Fork River. Shortly after the adit water enters the Mary Ellen Gulch tributary, (within 300 feet) it enters onto National Forest System lands.

PACIFIC MINE: (Survey Number 5361, Plat Index Number 491 originally known as the Blue Rock #2 claim) the Mine is owned by the Euro-Nevada Mining Corporation, Inc. 6121 Lakeside Drive, Suite 240, Reno, Nevada 89511, (702) 825-8890. The majority of the tailings pile and settling pond exist on National Forest System land.

LOWER BOG MINE: (Survey Number 5422, Plat Index Number 451) Originally patent 6/24/1910. Last owner Lorraine B. Jack et al who sold the land to United States of America on 10/14/1966 and is now National Forest System lands.

SITE STATUS:

MARY ELLEN GULCH MINE: The Mary Ellen mine is currently inactive however, the Globe mine which is adjacent (upstream) to the Mary Ellen Mine is active.

PACIFIC MINE: The Pacific mine is currently inactive.

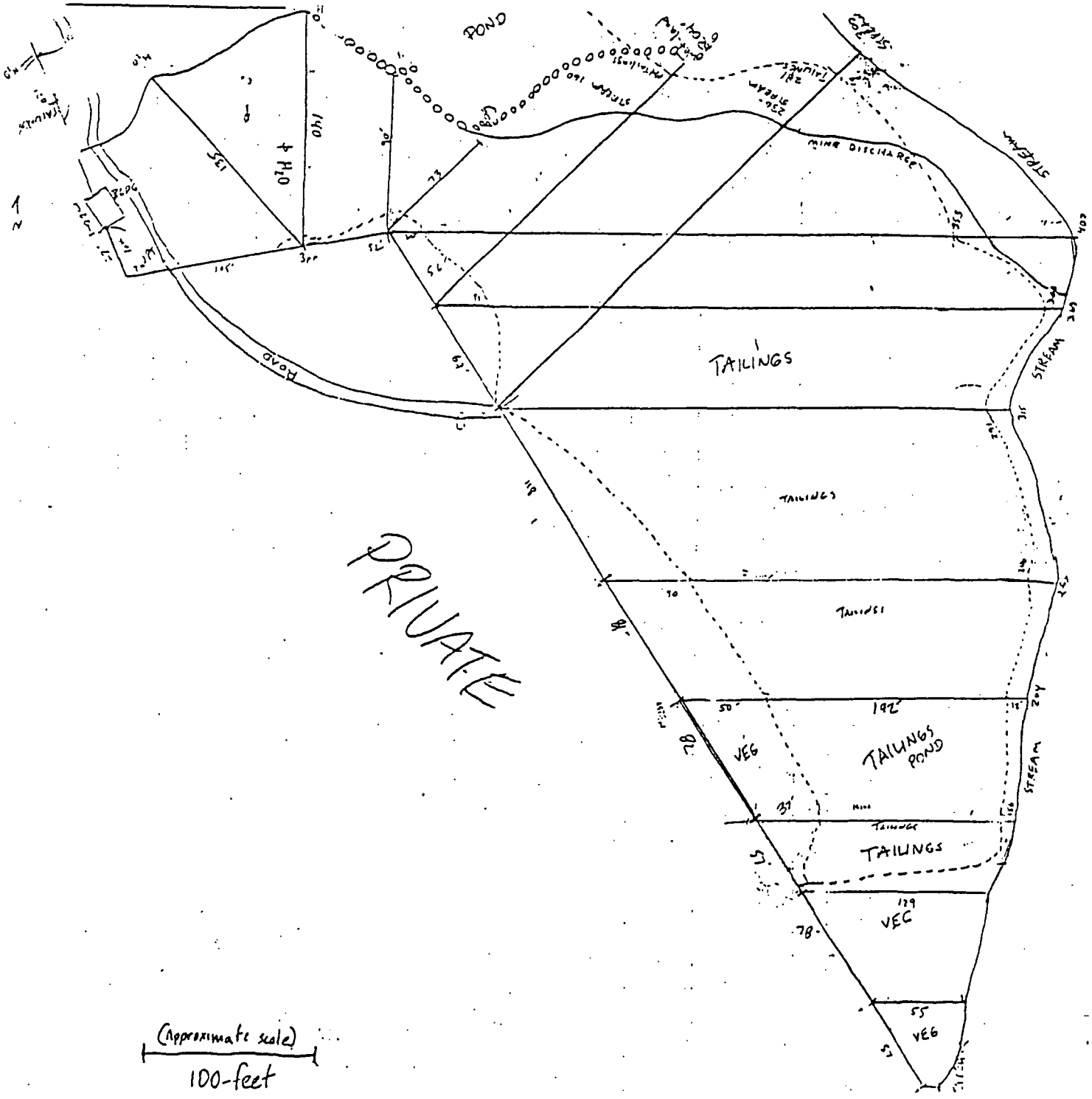
LOWER BOG MINE: The Lower Bog mine is currently inactive.

YEARS OF OPERATION:

Each of the mines have been reviewed by Uinta National Forest Archeologist for cultural and historical significance and are all eligible for National Historic Register status.

MARY ELLEN GULCH: The Mary Ellen gulch mine was located in 1870. A patent was filed for operation in 1876. Activity occured periodocially through 1959.

PACIFIC MINE: Formally known as the Blue Rock #2 was located in 1903. At this time, there was evidence of three tunnels prior to location. Activity at this



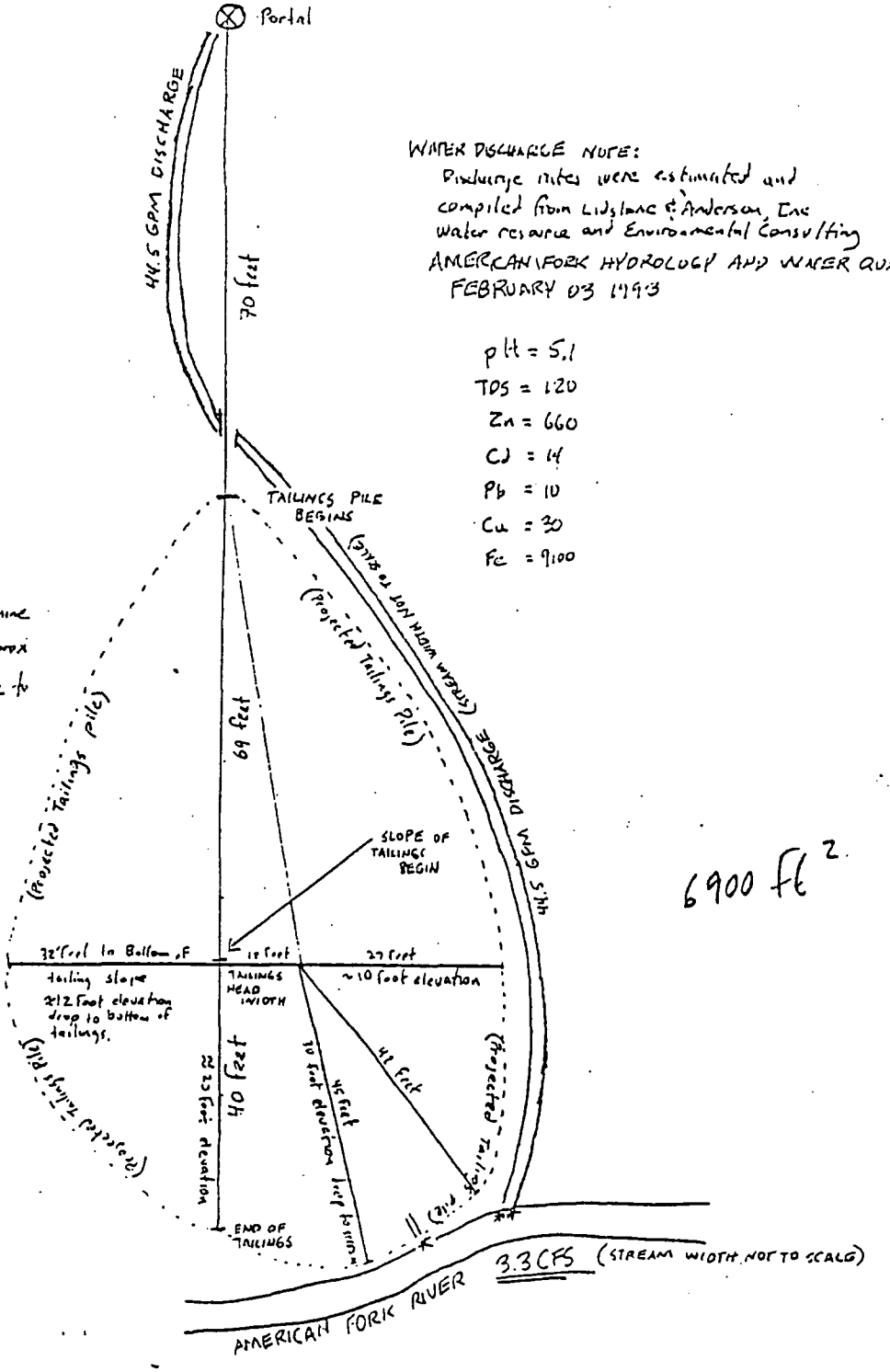
Pacific Mine tailings pond
November 5. 1993
Tim Garcia & Jill Schroeder

= tailings perimeter
= wet lands

120,000 ft²

Lower Bog Mine
American Fork Canyon
Uinta National Forest

Pleasant Grove Ranger District
November 04, 1993 1040 hours
Tim Garcia & Paul Skabland



WATER DISCHARGE NOTE:
Discharge rates were estimated and compiled from Lindsay & Anderson, Inc water resource and Environmental Consulting
AMERICAN FORK HYDROLOGY AND WATER QUALITY STU
FEBRUARY 03 1993

pH = 5.1
TDS = 120
Zn = 660
Cd = 14
Pb = 10
Cu = 30
Fe = 9100

The dotted line represents the area the tailings represent below the Lower Bog mine
The elevation or depth ranges from Approx is feet deep at the beginning of the pile to a [illegible] foot elevation depth where the are adjacent to the American Fork River

6900 ft^2.

(Approximate scale)
20 Feet

* 0.2 GPM DISCHARGE
** 44.5 GPM DISCHARGE

mine was at it's height between 1910 and the late 1940's. There has been a resurgence of interest in making further explorations of this mine in the last decade by it's current owner; however no significant work has been done since the 1940's.

LOWER BOG: The Bog mine was located in 1895 by Ed Hines. Initial surveys were conducted in 1905 with actual work begining in 1914. Active mining occured through the 1940's and finally operations shut down in the late 1940's. Some prospecting occured later in the 1970's however the majority of activity occured between 1914 and the late 1940's

OWNER/OPERATOR INFORMATION:

MARY ELLEN GULCH: William D. Schnack c/o Associated Title Co.,P.O. Box 478, Salt Lake City , UT,84110-0478, Attn: Lyle Swenson

PACIFIC MINE: Euro-Nevada Mining Corporation, Inc. 6121 Lakeside Drive, Suite 240, Reno, Nevada 89511, (702) 825-8890 owns the mine and some tailings however, the majority of the tailings pile and settling pond exist on National Forest System land.

LOWER BOG: United States of America, National Forest System Lands.

ENVIRONMENTAL SETTING:

MARY ELLEN GULCH: The Mary Ellen Gulch mine is located at approximately 9,000 feet above sea level. Dominant vegetation types include upper elevation riparian, alpine spruce/fir type and high elevation mountain brush.

PACIFIC MINE: The Pacific Mine is located in the bottom of the North Fork of the American Fork Canyon at approximately 7800 feet AMSL. Vegetation consists of mixed conifer stands to the west and riparian vegetation skirting the east perimeter of the tailings pile and settling pond. The North Fork of the A.F. river runs within 10 feet of the tailings around the east side of the mine tailings area.

LOWER BOG: The Lower Bog is located along a stream corridor consisting of associated high elevation riparian vegetation types. The adit is in a high elevation mountain brush zone.

APPROXIMATE SIZE OF SITE:

MARY ELLEN GULCH – Private

PACIFIC MINE: Operations at the Pacific mine cover an area of approximately 120,000 square feet. The majority of this area is used as a tailings and settling pond. The average depth of the tailings around the area is estimated at approximately five feet. The total volume of the tailings has been estimated at 600,000 cubic feet of tailings containing elevated levels of zinc, cadmium, lead, and copper. There are remains of buildings associated with the Pacific mine operation however; no intact structures are present.

LOWER BOG: Groundwater discharge and tailings pile make up the facility at the Lower Bog mine. The area associated with the mine involves about 6900 square feet. The average depth of the tailings is approximately 10 feet, with total volume being approximately 69,000 cubic feet. There are no facilities associated with the Lower Bog mine.

SOURCE AND WASTE CHARACTERISTICS:

SOURCE TYPES AND LOCATIONS:

MARY ELLEN GULCH: Groundwater discharge is the primary source of contamination in the Mary Ellen Gulch location. Groundwater surfacing from the adit contains elevated levels of zinc, iron, copper, lead, and cadmium. The Mary Ellen Gulch Mine is located along a south east flowing tributary drainage to the North Fork of the American Fork River at an elevation of 9,100 feet. The site has several portals, tailings and waste rock piles. The North portal has a pH of 5.95, while the south portal has a 7.2 pH. The North Portal discharges 70 GPM (Gallon Per Minute) with the south portal discharging only 2.5 GPM (Lidstone & Anderson 1993).

PACIFIC MINE: There are two major waste characteristics involved at the Pacific mine site. The first is the extensive tailings pile and settling pond associated with past mining activities. Dust transported by wind and precipitation run-off are both causes for the spread of these tailings from the site. Tailings and the settling pond are both within a distance of 10 to 50 feet from the American Fork river. The second Source of pollution is ground water discharge from the Pacific mine adit itself. 144 GPM discharge with a pH of 6.5 was measured from the Pacific mine portal with elevated levels of lead, zinc, copper, and cadmium (Lidstone & Anderson 1993).

LOWER BOG: The Lower Bog mine has an elevation of about 8500 feet. The site consists of a single bedrock opening, tailings dump, and miscellaneous spoil piles. Discharge from the adit is approximately 44 GPM with "yellow boy" or hydrous iron oxide deposits around the area of discharge. pH levels were measured at 5.1 with total disolved solids at 80 parts per million (PPM). 1992 samples indicate elevated levels of iron, cadmium, zinc, copper, and lead. Discharge from the mine adit flow boths around both sides of the tailings located below the mine opening (Lidstone and Anderson 1993).

HAZARDOUS SUBSTANCES PRESENT:

The following elements identified exceed aquatic standards:

MARY ELLEN GULCH: Elevated levels of zinc and iron are present (Mangum, 1988).

PACIFIC MINE: Elevated levels of lead, cadmium, zinc, and copper are present (Mangum, 1988).

LOWER BOG: Elevated levels of lead, cadmium, zinc, copper, and iron are present (Mangum, 1988).

Testing of each site has occured on several occasions. Results of these tests can be seen in section IV of this text.

GROUND WATER USE AND CHARACTERISTICS

General Narrative:

Sources of contamination are poorly contained. The tailings are not enclosed allowing infiltration to freely occur. Ground water that is discharged from the mine adit is being discharged already contaminated (Mangum, 1988). The source is less likely to contaminate ground water than it is to contaminate near by surface water. The waste quantities at any one of the three would not be considered particularly large; however the waste at all three sites combined would be considered large.

Annual precipitation for all three areas is approximately 40 inches annually. Much of the precipitation comes in the form of snow between the months of November and April. Infiltration rates at all three areas would not be considered exceptionally high; but rather should be considered average with none of the areas having evidence of karst terrain.

PRIVATE WELLS WITHIN 4 MILES: There are no known private wells within four miles of any of the three mines sites identified. The areas downstream from the Pacific mine particularly is a popular site for camping and fishing. Campers, upon occasion may still drink directly form the American Fork River directly below the Pacific mine tailings.

SURFACE WATER USE AND CHARACTERISTICS

DISTANCE TO NEAREST SURFACE WATER:

MARY ELLEN GULCH: The closest surface water to the Mary Ellen adit is within 30 feet. The effluent from the adit flows down across mine waste and directly into the Mary Ellen Gulch tributary of the American Fork River.

PACIFIC MINE: The tailings pile and settling pond is within 10 feet of the American Fork River. During precipitation events, run off will flow directly across the tailings and into the river. The effluent from the Pacific mine adit flows into a wetland area created by beaver activity. This beaver pond captures some of the contaminants preventing a strong solution from entering the American Fork stream channel (Lidstone & Anderson, 1993). However there is evidence that some elements enter the stream.

LOWER BOG MINE: Tailings from the Lower Bog mine are within 3 feet of the main channel of the American Fork River. In addition to the exposure of surface water, adit discharge runs over and around the tailings. Either adit discharge or springflow flows beneath the tailings pile and enters the stream from beneath the mine tailings.

SURFACE WATER BODY TYPES WITHIN 15 DOWNSTREAM MILES

Tibble Fork Reservoir is approximately 7 downstream miles from the lowest site (Mary Ellen Gulch). It is used as a flood control structure. Water collected there is also used for agricultural irrigation in the Utah County area. No evidence has been collected indicating the contamination of Tibble Fork

Reservoir as a result of these sites. Evidence in fact shows little effects of the contaminants less than a mile down stream from the lowest source.

FISHERIES WITHIN 15 DOWNSTREAM MILES:

All three mines are located in the American Fork drainage. The American Fork river, including Tibble Fork Reservior is a put and take fishery managed primarily for rainbow trout. Secondary management is for brown and cutthroat trout. The Utah Division of Wildlife Resources (DWR) stocks approximately 35,500 fish a year in the stream reach from Mary Ellen Gulch to the mouth of American Fork Canyon, which is a distance of approximately 11.6 stream miles.

No studies have monitored fish downstream of the mines for contaminants. It is not known if, or at what levels fish retain contaminants from the mines. Many of the planted fish do not overwinter and spawn. A small, but important native cutthroat trout population does overwinter and spawn in this drainage. The majority of fish caught in the American Fork river have been in the drainage less than one year. Fisherpersons commonly keep and eat the fish they catch.

Quantifying the actual number of recreation fishing hours on the American Fork river is difficult, but the DWR manages the American Fork river as a "heavy use" area and has a goal of 500 angler-hours/acre/year.

Numerous log structures designed to enhance fish habitat have been installed along the upper reaches of the American Fork River. Rainbow trout congregate in the pools below these structures and encourage fishing below the discharge of the three mines. Tibble Fork Reservoir was built as a sediment trap and traps sediment associated with the discharge from the sites. Dissolved pollutants may travel below the reservoir.

SENSITIVE ENVIRONMENTS AND WETLANDS WITHIN 15 DOWNSTREAM MILES:

SOIL EXPOSURE CHARACTERISTICS:

General Narrative

Soil effects are localized and restricted to immediately around each of the three sites. Little evidence has been gathered indicating effects to the soil resources.

AIR PATHWAY CHARACTERISTICS:

General Narrative

Effect of the air pathway is localized at all three sites. Localized wind at each site has the potential to transport contaminated tailing dust within a close proximity of each site. The threat of air pathway contamination is not fully known. Dust from these areas has been witnessed by individuals and seems to be the only threat to the air pathway.

LOCATIONS OF SENSITIVE ENVIRONMENTS WIHTIN 4 MILES:

ACREAGE OF WETLANDS WITHIN 4 MILES:

Wetlands

The entire watershed within a radius of 1/4 and 1/2 miles of the Pacific mine drains into the North Fork of American Fork Creek. A wetland approximately 2 acres in size is associated with a beaver pond in the stream. The beaver pond is within 1/4 mile of the Pacific Mine. Approximately 4 acres of sensitive environments (riparian areas) exist along the stream channel. Two acres in the 1/4 mile radius and 2 acres within the 1/2 mile radius. No other wetlands or sensitive environments occur within 1/2 mile of the Pacific Mine.

	ONSITE	1/4 mi.	1/2 mi.
Wetlands	0.1 acres	2 acres	0 acres
Sensitive Env.	0.2 acres	2 acres	2 acres
Total	2.1 acres	4 acres	2 acres

LOWER BOG MINE 10/93
ADIT discharge entering North Fork
American Fork stream

LOWER BOG MINE 10/93
ADIT discharge from ADIT (upper center
photo)

LOWER BOG MINE 10/93

ADIT discharge entering North Fork
American Fork stream.

LOWER BOG MINE 10/93

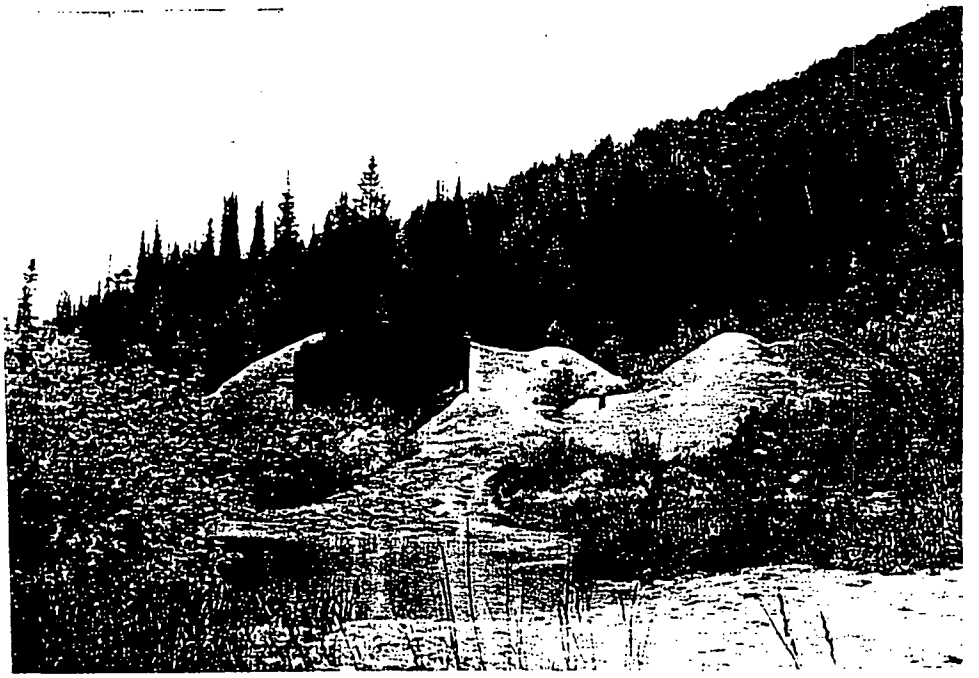
"Yellow Boy" discolored sediment
entering North Fork American Fork river

PACIFIC MINE 6-94
Panoramic View (similar to 1910 photo).
Beaver pond (right)
Tailing and settling pond

PACIFIC MINE 6-94
ADIT Discharge
(Notice dis-colored appearance)

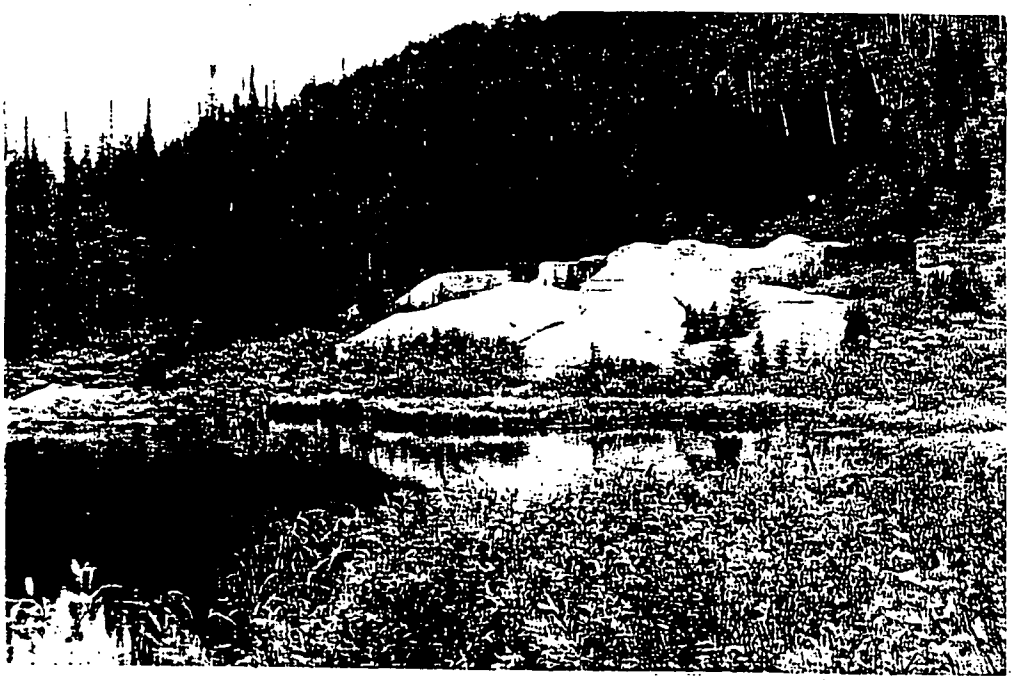
PACIFIC MINE - 6-94
Tailings Pile (foreground)
Settling Pond (center)

PACIFIC MINE 6-94
ADIT discharge



PACIFIC MINE 6-94

ADIT discharge running through tailings.



PACIFIC MINE 6-94

Beaver pond (foreground)
Pacific tailings

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United States Department of Agriculture | Forest Service | R-4

JUN 7 '89

4300/2840

Subject: Old Mining Disturbances - American Fork Canyon

To: Forest Supervisor, Uinta NF

On May 30, 1989, I visited the Pacific Mine, the Lower Bog Mine, and the Mary Ellen Gulch Mines in American Fork Canyon. I was with Paul Skabelund of the SO and two employees of the State of Utah. All of these mines have been inactive for a long time.

The existing water effluent from these mines is not good quality water. Paul Skabelund's data from BYU indicated that these mine effluents are high in one or more of lead, cadmium, or zinc. On the other hand, it is important to note that there are fish in the river only a short distance downstream from any of these mines. The benthic organisms in the streams may suffer a decline during the late summer season.

The Lower Bog Mine is apparently entirely on the Uinta National Forest, but both the Pacific and Mary Ellen Gulch Mines have a mixed federal-private ownership. On these two mines, less than half of the effected area is on National Forest land. This mixed ownership situation probably means that the State of Utah would have to be an active partner if a significant cleanup effort is to be made. The State may have to put legal pressure on the private landowners to spend money to clean up their land. In my view, that is extremely unlikely. Even though these mine water discharges are in violation of State water quality standards, there is little likelihood that the State will act to bring these waters back into compliance with the standards. This is due to the facts that the mine discharges predate the water quality standards law; the mine discharges are in compliance with the State non-degradation clause; and the existing mine discharge is just not all that bad.

The adit flow from the Lower Bog Mine could be collected, piped a short distance, and run through an artifically constructed wetlands. Properly done this treatment could result in improved water quality flowing from the adit to the American Fork River. However, this would be expensive due to the steep rocky terrain, the need to build individual wetland cells, and the need to make significant improvements to the existing road. I estimate the costs at about $40 to $75 thousand.

From a technical viewpoint, both the Pacific and Mary Ellen Gulch Mines can be cleaned up and stabilized. It would be expensive, $40 to $65 thousand on the Pacific and $1 to $2 million on the Mary Ellen Gulch.

These costs make it doubtful that the potential improvement in water quality is worth the cost. However, I do believe that we can affect some material increase in water quality at a relatively low cost by taking steps to keep adit flows or other surface waters from flowing over or through tailings and waste rock piles. This could be done by gathering up these surface waters and

putting them into concrete ditches or plastic pipes and taking them directly to the river. This would prevent further deterioration of surface water quality and would be a useful step at a reasonable cost--a few thousands of dollars at the Pacific Mine and perhaps $25 thousand at the Mary Ellen Mines. I would suggest that you might consider this action as a fishery improvement project. A hindrance to this mitigation is the mixed ownership; we do not control the lands around these adits.

Every year all of these sites are loosing significant amounts of tailings and waste rock dust through wind erosion.

CONCLUSION AND RECOMMENDATION

We are in a poor position to initiate any cleanup action at the Pacific Mine or the Mary Ellen Gulch Mines because of the ownership situation and the relatively innocuous nature of the problem. On the other hand, it would be useful and relatively cheap to pipe the adit water across the contaminated tailings and waste rock piles. Perhaps that could be done to improve the fisheries.

I recommend that you take no action at the Lower Bog Mine since this mine is a very minor contributor to the overall water quality problems in the North Fork of the American Fork River.

for EUGENE E. FARMER
West-Wide Reclamation
Specialist

cc:
RW - Stender
MAM - Farmer

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M

Norman H. Bangerter
Governor
Dee C. Hansen
Executive Director
Dianne R. Nielson, Ph.D.
Division Director

State of Utah

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
801-538-5340

August 7, 1990

Mr. Paul Skablund
Uinta National Forest
100 North 88 West
Provo, Utah 84601

Dear Mr. Skablund:

The Utah Abandoned Mine Reclamation Program is concerned with mitigating physical hazards to the public health and safety that occur on abandoned mine sites. We would be able to provide you with plans and specifications for typical closure techniques to secure abandoned mine portals and other work specifications for earthwork, demolition, etc. Possibly a staff member could discuss with you how to draw up reclamation plans for particular sites.

If health hazards are present due to toxic substances, the Utah Department of Health, Environmental Health section, usually takes responsibility.

Possible solutions to the Pacific and Mary Ellen Gulch mines, where extensive tailings dumps are present would be to: 1) route runoff around the dumps and try to stabilize the dumps in place, or 2) remove the dump materials to a lower precipitation site. Removing the dumps would be expensive, logistically difficult and could aggravate the problems present by introducing oxygen into the system. Off-road vehicle use should be prevented at the Pacific Mine tailings area.

From the information in Dr. Merritt's report, elevated levels of cadmium, copper, lead and zinc are present but confined somewhat to localized areas within a mile of the discharge point. Methods to lower these levels are generally prohibitively expensive. It does appear that some of the parameters sampled, particularly copper, lead and zinc increase substantially after flowing through the dump material. Thus, I would recommend preventing, as much as possible, all runoff from flowing over or through the dump.

Please call me if you would like to discuss this further. I would appreciate it if you would keep me informed about the progress of this project.

Sincerely,

Lucia Malin
Senior Reclamation Specialist

AM806/186

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N

PHS

Norman H. Bangerter
Governor
Dee C. Hansen
Executive Director
Dianne R. Nielson, Ph.D.
Division Director

State of Utah

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
801-538-5340

January 20, 1993

Mr. Paul Skabelund
Uinta National Forest
88 West 100 North
Provo, Utah 84601

UINTA NATIONAL FOREST
JAN 25 1993
cc: D-2

Dear Mr. Skabelund:

Re: American Fork Mine Site Analyses and Reclamation Recommendations

Enclosed please find one bound original and one unbound copy of Lidstone & Anderson's **American Fork Hydrology and Water Quality Study**. The report, in addition to supplementing the earlier water quality work of Merritt, examines the geochemistry of the area, identifies biological, geochemical, and hydrological controls at each site, and develops mitigation alternatives and recommendations. The report also acknowledges a need for further data collection and analysis. Below I have attempted to summarize the salient issues in the report.

ABIOTIC AND BIOTIC FACTORS

Two abiotic factors, geological and hydrological, are operating to reduce the severity of the off site impacts of the Pacific Mine, mines in Mary Ellen Gulch, and the Lower Bog Mine: 1) high buffering capacity due to a host rock rich in carbonates; and 2) high dilution ratios, up to 33:1 at the Lower Bog Mine. These factors result in a change in pH values measured at the mine portals and downstream of 5.1 to 7.52 at the Lower Bog Mine, 6.5 to 8.02 at the Pacific Mine, and 6.95 to 7.95 at Mary Ellen Gulch.

The beaver pond at the Pacific mine appears to play a significant biotic role in removing trace elements from the portal effluent, specifically, zinc, cadmium, and lead. The effectiveness of the beaver pond clearly identifies its potential role in any reclamation activity undertaken at the Pacific Mine.

MITIGATION ALTERNATIVES

Pacific Mine

Based on the analysis of the data collected, reclamation at the Pacific mine is the highest priority. Two sources of

These problems could be addressed in two or three phases. Phase one would route all portal drainage off the tailings pile and via a riprap ditch into the beaver pond. Phase two would isolate, recontour and treat, topsoil, and revegetate the tailings dumps. A third phase would develop a wetland above the beaver dam to provide additional treatment to the portal effluent if water sampling after completion of phase one indicated a decrease in the ability of the beaver pond to treat the portal discharge adequately.

Lower Bog Mine

Due to the inaccessibility of the Lower Bog mine, the limited magnitude of the problem it presents, and the high dilution ratio (33:1), no reclamation action is recommended.

Mary Ellen Gulch Mines

A suite of problems exist at the Mary Ellen Gulch site ranging from trace metal contamination in the creek to active mining exploration in the Belorophan mine and at the Yankee dumps. Samples taken in Mary Ellen Creek identified contamination but an insufficient number of samples were collected to fully characterize the source. The sample identified as AF#7 taken from the most northerly portal on the mine bench did not show elevated metals except for zinc, suggesting some other source of contamination exists. This could possibly be from the tailings piles or the mining activity occurring at the Belorophan mine. The Utah Division of Oil, Gas and Mining's Minerals Program issued a Small Mining Operations permit for the "Yankee Project" in August of 1992, after we noticed mining activity taking place while sampling in the area. The operator, James Warr, was advised by DOGM's Minerals Program in a July 27, 1992 letter of the following issues: 1) that the Forest Service was very concerned about any off site impacts to Mary Ellen Creek and surrounding areas; 2) that if old workings were developed a UPDES permit would be required from the Division of Water Quality; and 3) that the mine dumps had been placed on the CERCLIS list and that the operators might be responsible for some expensive CERCLA cleanup.

Due to the complexity of the situation at the Mary Ellen Gulch site, further study is warranted to identify the specific source(s) of contamination and allow for some resolution to occur with regards to the mining activity prior to developing reclamation alternatives for this site.

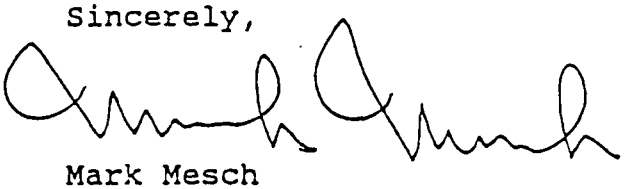
Miller Hill Tailings

Water sampling was not performed at this site. No portal discharge is occurring, and the adverse effects are more a result of erosive conditions along the toe of the pile during high water stream flows. Tailings samples taken by the Forest Service and analyzed by Utah State University Soil Testing Laboratory for crop production/vegetation success are within the range for plant establishment and growth. Revegetation, however, does not remedy the problem that the location of the tailings presents to the North Fork of American Fork. Based on the rather small areal extent of the tailings pile and the ease of access, removal may be the best alternative.

Utilizing the tailings as road surface material may be an effective form of disposal. However, the following precautions are warranted. Testing for total soluble metals is recommended. Soluble metals leaving road surfaces during rain storms or as snowmelt could be problematic and affect off site areas. Spreading the tailings out over a large area (i.e. roadway) would also increase the oxidation rate by increasing the surface area of the tailings, as opposed to keeping the tailings confined as a single deep pile. Tailings should be mixed with locally obtained limestone material prior to placement as road surface. This would continue to buffer the tailings material once in place on the road surface. Finally, any road sites selected for tailings placement should be situated away from water courses.

Using the report's recommendations for the Pacific mine, I will develop construction costs for the work phases. After you have had time to review the report we can arrange for a meeting to discuss the report and the direction the Forest Service wishes to take in addressing the reclamation at these sites.

Sincerely,



Mark Mesch
Reclamation Specialist
Abandoned Mine Reclamation Program

MRM
Enclosures
WP.Skabelun.Let